

Utah State Hospital Consolidation  
Department of Human Services  
1300 East Center Street  
Provo, Utah

Bid Document Specifications  
VOLUME 1 (Divisions 00 – 08)

September 12, 2012

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## SECTION 01 0000 – GENERAL REQUIREMENTS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes general requirements that are to apply to all Work throughout the Project. Requirements included in this Section are to apply to all other specification Sections.

#### 1.2 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. “Center of...”: Indicates a specific single point at the exact center of the tile, panel, or other surface indicated.
- C. “Conforms”\*: When used to convey Architect's action on Contractor's submittals, applications, and requests, “conforms” is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
- D. “Contractor or C.M.”: The Construction Manager/General Contractor (CMGC) as indicated in General Conditions document, unless otherwise stated.
- E. “Directed”: A command or instruction by Architect, unless indicated as by Owner. Other terms including “requested,” “authorized,” “selected,” “approved,” “required,” and “permitted” have the same meaning as “directed.”
- F. “Furnish”: Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. “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.”
- H. “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.
- I. “Project Manager”\*: The Contractor’s project manager.
- J. “Project Representative”\*: The Owner’s project representative(s).
- K. “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.

- L. "Provide": Furnish and install, complete and ready for the intended use.
- M. "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.
- N. "Related Sections": Related Sections articles are included herein as a courtesy to assist in the locating of items in the specifications that the reader might expect to find in the Section but that are specified elsewhere. The list of sections may or may not be complete. 'Related Sections' articles do not relieve the Contractor of the contractual obligation to perform to all the Contract Documents or to coordinate who does what amongst the team of subcontractors.

### 1.3 SITE INSPECTION

- A. Examine the premises and site and compare them with the drawings and specifications.
- B. Become familiar with existing conditions such as obstructive areas, excavating or filling, and any problems related to construction. No allowances will subsequently be made by reason of failure to examine the site.

### 1.4 SCOPE OF THE WORK

- A. See Division 1 Section 01 1000 "Summary" for an overall general summary of the Work.
- B. Unless otherwise provided, all materials, labor, equipment, tools, transportation, and utilities necessary for the successful completion of the Project shall be provided at the expense of the Contractor.
- C. Requirements of the Work are contained in the Contract Documents, and include cross-references herein to published information, which is not necessarily bound therewith.
- D. Provide, as part of the Bid and without additional charge, all incidental items required for completion of the Work, even if not specifically indicated.
  - 1. Install all Work so that its several component parts function together as a complete and workable system, and with all equipment properly adjusted and in working order.
- E. Conform to highest quality standards for materials and workmanship to execute Work that is indicated or specified and that is necessary to fully satisfy the Contract Document requirements for a complete, finished, acceptable installation regardless of whether indicated or specified or not.
- F. Responsibilities of the Contractor includes the responsibility to verify all field measurements of actual building conditions so that all Work fits properly in the locations indicated and specified. Protect existing structures, improvements, trees, and other items from physical damage, unless identified to be removed.

- G. Any existing surfaces, furniture or equipment that are damaged by the Contractor are to be restored to their original condition, or better, to the satisfaction of the Owner.
- H. Restore roads, utilities, walks, curbs, gutters or other improvements belonging to the Owner, to the same condition as they existed prior to commencement of construction. Where said improvements are damaged, they shall be replaced by new Work to match existing adjacent Work, or repaired if acceptable to Project Representative, at no cost to Owner.

#### 1.5 WORKERS

- A. Enforce strict discipline and good order among his/her employees at all times and shall not employ on the Project any unfit person or anyone not skilled in the Work assigned to him/her.
- B. Consumption of alcohol or any other controlled, non-medically prescribed substance will not be allowed on the Project.
- C. Rectify behavior unacceptable to the Owner or Owner's Project Representative by strict enforcement of discipline. Owner reserves the right to request dismissal of individual workers for failure to comply with standards of behavior communicated to the Contractor.

#### 1.6 TAXES

- A. The Contractor shall pay sales, use, payroll, unemployment, old age pension, or surtax applicable to this project.
- B. The Owner shall pay taxes and assessments on real property comprising the site of this project.

#### 1.7 MANUFACTURER'S DIRECTIONS

- A. Manufactured articles, materials, or equipment shall be applied, installed, connected, erected, used, cleaned, and conditioned in accordance with the Manufacturer's printed directions unless otherwise indicated in the Contract Documents.

#### 1.8 FACILITY SECURITY REQUIREMENTS

- A. Prior to acceptance by the Owner or Architect, demonstrate functionality of the following:
  - 1. Building security systems.
  - 2. Emergency lockdown systems.

#### 1.9 FASTENERS

- A. Unless noted otherwise, the trade requiring the fastening of its Work to any substrate or support is responsible for provision and installation of requisite fasteners.

B. Use tamper-resistant screws and fasteners at Pediatric Facility.

1. Basis of Design for fastening fixtures and devices: Torx security pin screws.

1.10 PENETRATIONS

A. The sealing of all penetrations in fire-rated, acoustically-rated or structural partitions and separations is the responsibility of the trade making or requiring the penetration.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 0000

## SECTION 01 1000 - SUMMARY

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Owner-furnished products.
4. Access to site.
5. Coordination with occupants.
6. Work restrictions.
7. Specification and drawing conventions.

##### B. Related Requirements:

1. Section 01 5000 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

#### 1.2 PROJECT INFORMATION

##### A. Project Identification: Utah State Hospital Consolidation, Department of Human Services; FFKR Job Number 11111.

1. Project Location: 1300 east Center Street, Provo Utah.

##### B. Owner: Utah Department of Facilities Construction and Management (DFCM.)

1. Owner's Representative: Jim Russell.

##### C. Architect: FFKR Architects, 730 Pacific Avenue, Salt Lake City, Utah 84104.

##### D. Architect's Consultants: The Architect has retained the following design professionals who have prepared designated portions of the Contract Documents:

1. Structural Engineer: Reaveley Engineers and Associates.
2. Mechanical and Civil Engineer: Van Boerum & Frank Associates, Inc.
3. Electrical Engineer: Spectrum Engineers.

##### E. Project Web Site: Newforma, administered by Architect. All Submittals and RFIs received through Newforma.

### 1.3 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work of Project is defined by the Contract Documents and consists of the construction of two structures as follows:
  - 1. Mark I. Payne Building: Single-story, steel and CMU structure, designed to accommodate clinical administration activities.
  - 2. Pediatric Facility: Single-story, multiple-wing, steel and CMU structure designed to house and accommodate educational needs for adolescents.
- B. Type of Contract:
  - 1. Project will be constructed under a single prime contract.

### 1.4 OWNER-FURNISHED PRODUCTS

- A. Owner will furnish products indicated. The Work includes receiving, unloading, handling, storing, protecting, and installing Owner-furnished products and making building services connections.
- B. Owner-Furnished Products:
  - 1. Furnishing, appliances and other items as coordinated with Owner.

### 1.5 ACCESS TO SITE

- A. General: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.
- B. See Division of Facilities Construction and Management; General Conditions; Article 4 Contractor; 4.10 Use of Site; 4.10.1 in General.
- C. See Division of Facilities Construction and Management; General Conditions; Article 2 DFCM; 2.2 Construction by DFCM or by Separate Contractors; 2.2.1 DFCM's Right to Perform Construction and to Award Separate Contracts.
- D. Use of Site: Limit use of Project site to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
  - 1. Limits of Site Disturbance: 40 feet beyond building; 10 feet beyond surface paving and utilities; 15 feet beyond roadway and main utility branch trenches; 25 feet beyond constructed permeable surfaces (such as pervious paving, stormwater detention facilities, and playing fields).
  - 2. Driveways, Walkways and Entrances: Keep driveways and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.

- a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
- b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

#### 1.6 WORK RESTRICTIONS

- A. See Division of Facilities Construction and Management; General Conditions; Article 4 Contractor; 4.10 Use of Site; 4.10.2 Access to Neighboring Properties.
- B. Work Restrictions, General: Comply with restrictions on construction operations.
  1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.
- C. Nonsmoking Building: Smoking is not permitted within the building or within 25 feet of entrances, operable windows, or outdoor-air intakes.
- D. Controlled Substances: Use of tobacco products and other controlled substances on Project site is not permitted.
- E. Employee Identification: Provide identification tags for Contractor personnel working on Project site. Require personnel to use identification tags at all times.
- F. Employee Screening: Comply with Owner's requirements for drug and background screening of Contractor personnel working on Project site.
  1. Maintain list of approved screened personnel with Owner's representative.

#### 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 Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:

1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
2. 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 01 1000

## SECTION 01 2300 - ALTERNATES

### PART 1 - GENERAL

#### 1.1 SUMMARY

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

#### 1.2 DEFINITIONS

- A. Alternate: An amount proposed by bidders for certain work that may be added to or deducted from the base bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

#### 1.3 PROCEDURES

- A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
  1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.
- B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated revisions to alternates.
- C. Execute accepted alternates under the same conditions as other work of the Contract.
- D. Schedule: A schedule of alternates is included at the end of this Section.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

- A. Alternate No. 1: Add Southwest Wing to Pediatric Building.
  - 1. Base Bid: Construct Pediatric Building as indicated, without including Southwest Wing.
  - 2. Alternate: Construct Pediatric Building including Southwest wing as indicated in Drawings
  
- B. Alternate No. 2: Construct stand-alone building envelope mock-ups.
  - 1. Base Bid: Sample panels and material mock-ups only, as indicated in specifications.
  - 2. Alternate: Include full stand-alone building envelope mock-ups for each building as indicated in drawings.
  
- C. Alternate No. 3: Demolish Medical Services Building.
  - 1. Base Bid: Medical Services building to remain.
  - 2. Alternate: Completely demolish Medical Services Building.
  
- D. Alternate No. 4: Landscaping.
  - 1. Base Bid: Do not include Landscape Work in bid.
  - 2. Alternate: Perform landscape Work as indicated.

END OF SECTION 01 2300

## SECTION 01 2500 - SUBSTITUTION PROCEDURES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for substitutions.
- B. Related Requirements:
  - 1. Section 01 6000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

#### 1.2 DEFINITIONS

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

#### 1.3 ACTION SUBMITTALS

- A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
  - 1. Substitution Request Form: Use CSI Form 13.1A.
  - 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 revisions needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
    - c. Detailed comparison of significant qualities of proposed 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. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
- a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
  - b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

#### 1.4 QUALITY ASSURANCE

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

#### 1.5 PROCEDURES

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

## PART 2 - PRODUCTS

### 2.1 SUBSTITUTIONS

- A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 30 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. Requested substitution provides sustainable design characteristics that specified product provided for achieving LEED prerequisites and credits.
    - 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: Architect will consider requests for substitution if received within 60 days after commencement of the Work. Requests received after that time may be considered or rejected at discretion of Architect.
1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
    - a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
    - b. Requested substitution does not require extensive revisions to the Contract Documents.
    - c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
    - d. Requested substitution provides sustainable design characteristics that specified product provided for achieving LEED prerequisites and credits.

- 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)

END OF SECTION 01 2500

## SECTION 01 2600 - CONTRACT MODIFICATION PROCEDURES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for handling and processing Contract modifications.
- B. Related Requirements:
  - 1. Section 01 2500 "Substitution Procedures" for administrative procedures for handling requests for substitutions made after the Contract award.

#### 1.2 MINOR CHANGES IN THE WORK

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

#### 1.3 PROPOSAL REQUESTS

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

- B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect.
1. 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 01 2500 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
  7. Proposal Request Form: Use form acceptable to Architect.

#### 1.4 CHANGE ORDER PROCEDURES

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

#### 1.5 CONSTRUCTION CHANGE DIRECTIVE

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

Utah State Hospital Consolidation  
Department of Human Services  
1300 East Center Street  
Provo, Utah

Bid Documents

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 2600

## SECTION 01 2900 - PAYMENT PROCEDURES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.
- B. Related Requirements:
  - 1. Section 01 2600 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
  - 2. Section 01 3200 "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.
  - 3. Section 01 8113 "Sustainable Design Requirements" for administrative requirements governing submittal of cost breakdown information required for LEED documentation.

#### 1.2 DEFINITIONS

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

#### 1.3 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.
  - 1. Coordinate line items in the schedule of values with other required administrative forms and schedules, including the following:
    - a. Application for Payment forms with continuation sheets.
    - b. Submittal schedule.
    - c. Items required to be indicated as separate activities in Contractor's construction schedule.
  - 2. Submit the schedule of values to Architect at earliest possible date, but no later than 30 days before the date scheduled for submittal of initial Applications for Payment.
- B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.
  - 1. Identification: Include the following Project identification on the schedule of values:

- a. Project name and location.
  - b. Name of Architect.
  - c. Architect's project number.
  - d. Contractor's name and address.
  - e. Date of submittal.
2. Arrange schedule of values consistent with format of AIA Document G703.
  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 Project Manual table of contents. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum.
    - a. Include separate line items under Contractor and principal subcontracts for LEED documentation and other 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 required, include evidence of insurance.
  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. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
    - a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.

9. Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

#### 1.4 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.
  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 period covered by each Application for Payment is one month, ending on the last day of the month.
  1. Submit draft copy of Application for Payment seven days prior to due date for review by Architect.
- C. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 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. Architect will return incomplete applications without action.
  1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
  2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
  3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
  4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.
- E. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.
  1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment, for stored materials.
  2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
  3. Provide summary documentation for stored materials indicating the following:
    - a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.

- b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
  - c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.
- F. Transmittal: Submit one signed and notarized original copy of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.
1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- G. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's liens from subcontractors, sub-subcontractors, and suppliers 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 conditional final or full waivers.
  3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
  4. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
  5. Waiver Forms: Submit executed waivers of lien on forms, acceptable to Owner.
- H. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
1. List of subcontractors.
  2. Schedule of values.
  3. LEED submittal for project materials cost data.
  4. Contractor's construction schedule (preliminary if not final).
  5. Combined Contractor's construction schedule (preliminary if not final) incorporating Work of multiple contracts, with indication of acceptance of schedule by each Contractor.
  6. Products list (preliminary if not final).
  7. LEED action plans.
  8. Schedule of unit prices.
  9. Submittal schedule (preliminary if not final).
  10. List of Contractor's staff assignments.
  11. List of Contractor's principal consultants.
  12. Copies of building permits.
  13. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
  14. Initial progress report.
  15. Report of preconstruction conference.
  16. Certificates of insurance and insurance policies.
  17. Performance and payment bonds.

18. Data needed to acquire Owner's insurance.
  - I. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
    1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
    2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
  - J. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
    1. Evidence of completion of Project closeout requirements.
    2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
    3. Updated final statement, accounting for final changes to the Contract Sum.
    4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
    5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
    6. AIA Document G707, "Consent of Surety to Final Payment."
    7. Evidence that claims have been settled.
    8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
    9. Final liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 2900

## SECTION 01 3100 - PROJECT MANAGEMENT AND COORDINATION

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
  - 1. General coordination procedures.
  - 2. Coordination drawings.
  - 3. Requests for Information (RFIs).
  - 4. Project Document Transfer site.
  - 5. Project meetings.
- B. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.
- C. Related Requirements:
  - 1. Section 01 3200 "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
  - 2. Section 01 7300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
  - 3. Section 01 7700 "Closeout Procedures" for coordinating closeout of the Contract.
  - 4. Section 01 9113 "General Commissioning Requirements" for coordinating the Work with Owner's Commissioning Authority.

#### 1.2 DEFINITIONS

- A. RFI: Request from Owner, Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

#### 1.3 INFORMATIONAL SUBMITTALS

- A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Use CSI Form 1.5A. 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.

#### 1.4 GENERAL COORDINATION PROCEDURES

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
  2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
  3. Make adequate provisions to accommodate items scheduled for later installation.
- B. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
1. Preparation of Contractor's construction schedule.
  2. Preparation of the schedule of values.
  3. Installation and removal of temporary facilities and controls.
  4. Delivery and processing of submittals.
  5. Progress meetings.
  6. Preinstallation conferences.
  7. Project closeout activities.
  8. Startup and adjustment of systems.
- C. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.
1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

## 1.5 COORDINATION DRAWINGS

- A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.
1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
    - a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
    - b. Coordinate the addition of trade-specific information to the coordination drawings by multiple contractors in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
    - c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
    - d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
    - e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
    - f. Indicate required installation sequences.
    - g. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
- B. Coordination Drawing Organization: Organize coordination drawings as follows:
1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
  2. Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within ceiling plenum to accommodate layout of light fixtures indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
  3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.
  4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
  5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door

- floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
6. Mechanical and Plumbing Work: Show the following:
    - a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
    - b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
    - c. Fire-rated enclosures around ductwork.
  7. Electrical Work: Show the following:
    - a. Runs of vertical and horizontal conduit 1-1/4 inches in diameter and larger.
    - b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire-alarm locations.
    - c. Panel board, switch board, switchgear, transformer, busway, generator, and motor control center locations.
    - d. Location of pull boxes and junction boxes, dimensioned from column center lines.
  8. Fire-Protection System: Show the following:
    - a. Locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.
  9. Review: Architect will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make changes as directed and resubmit.
  10. Coordination Drawing Prints: Prepare coordination drawing prints according to requirements in Section 01 3300 "Submittal Procedures."
- C. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:
1. File Preparation Format: Same digital data software program, version, and operating system as original Drawings.
  2. File Preparation Format: DWG, Version 12, operating in Microsoft Windows operating system.
  3. File Submittal Format: Submit or post coordination drawing files using format same as file preparation format and Portable Data File (PDF) format.
  4. Architect will furnish Contractor one set of digital data files of Drawings for use in preparing coordination digital data files.
    - a. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Drawings.
    - b. Digital Data Software Program: Drawings are available in AutoCad version 12 DWG.

- c. Contractor shall execute a data licensing agreement in the form of Agreement form acceptable to Owner and Architect.

#### 1.6 REQUESTS FOR INFORMATION (RFIs)

- A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
  1. Architect will return RFIs submitted to Architect 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 information or 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 resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
  12. Contractor's signature.
  13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
    - a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
- C. RFI Forms: AIA Document G716 or 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. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow 10 working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.
  1. The following Contractor-generated RFIs will be returned without action:
    - a. Requests for approval of submittals.

- b. Requests for approval of substitutions.
      - c. Requests for approval of Contractor's means and methods.
      - d. Requests for coordination information already indicated in the Contract Documents.
      - e. Requests for adjustments in the Contract Time or the Contract Sum.
      - f. Requests for interpretation of Architect's actions on submittals.
      - g. Incomplete RFIs or inaccurately prepared RFIs.
    2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
    3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 012600 "Contract Modification Procedures."
      - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 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 returned without action or withdrawn.
    5. RFI description.
    6. Date the RFI was submitted.
    7. Date Architect's response was received.
  - F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.
    1. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
    2. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.
- 1.7 PROJECT DOCUMENT TRANSFER SITE
- A. Use Architect's Project Newforma Document Transfer site for purposes of managing project communication and documentation until Final Completion. Project Document Transfer site shall include the following functions:
    1. Project directory.
    2. RFI forms.
    3. Task and issue management.
    4. Submittals forms and logs.

5. Drawing and specification document hosting, viewing, and updating.
6. Online document collaboration.
7. Reminder and tracking functions.
8. Archiving functions.

B. Architect will issue Drawings and Specifications through the Project Document Transfer Site.

C. Architect will accept and return RFIs and submittal documents only through the Project Document Transfer Site, unless otherwise arranged.

## 1.8 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner, and Architect, within seven days of the meeting.

B. Preconstruction Conference: Schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.

1. Conduct the conference to review responsibilities and personnel assignments.
2. Attendees: Authorized representatives of Owner, Owner's Commissioning Authority, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Discuss items of significance that could affect progress, including the following:
  - a. Tentative construction schedule.
  - b. Critical work sequencing and long-lead items.
  - c. Designation of key personnel and their duties.
  - d. Lines of communications.
  - e. Procedures for processing field decisions and Change Orders.
  - f. Procedures for RFIs.
  - g. Procedures for testing and inspecting.
  - h. Procedures for processing Applications for Payment.
  - i. Submittal procedures.
  - j. LEED requirements Preparation of record documents.
  - k. Use of the premises.
  - l. Work restrictions.

- m. Working hours.
  - n. Owner's occupancy requirements.
  - o. Responsibility for temporary facilities and controls.
  - p. Procedures for moisture and mold control.
  - q. Procedures for disruptions and shutdowns.
  - r. Construction waste management and recycling.
  - s. Parking availability.
  - t. Office, work, and storage areas.
  - u. Equipment deliveries and priorities.
  - v. First aid.
  - w. Security.
  - x. Progress cleaning.
4. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.
- C. LEED Coordination Conference: Owner will schedule and conduct a LEED coordination conference before starting construction, at a time convenient to Owner Architect, and Contractor.
1. Attendees: Authorized representatives of Owner, Owner's Commissioning Authority, Architect, and their consultants; Contractor and its superintendent and LEED coordinator; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
  2. Agenda: Discuss items of significance that could affect meeting requirements for LEED certification, including the following:
    - a. LEED Project Checklist.
    - b. General requirements for LEED-related procurement and documentation.
    - c. Project closeout requirements and LEED certification procedures.
    - d. Role of LEED coordinator.
    - e. Construction waste management.
    - f. Construction operations and LEED requirements and restrictions.
  3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.
- D. 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, Owner's Commissioning Authority of scheduled meeting dates.
  2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
    - a. Contract Documents.

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

behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

- 1) Review schedule for next period.
- b. Review present and future needs of each entity present, including the following:
- 1) Interface requirements.
  - 2) Sequence of operations.
  - 3) Status of submittals.
  - 4) Status of LEED documentation.
  - 5) Deliveries.
  - 6) Off-site fabrication.
  - 7) Access.
  - 8) Site utilization.
  - 9) Temporary facilities and controls.
  - 10) Progress cleaning.
  - 11) Quality and work standards.
  - 12) Status of correction of deficient items.
  - 13) Field observations.
  - 14) Status of RFIs.
  - 15) Status of proposal requests.
  - 16) Pending changes.
  - 17) Status of Change Orders.
  - 18) Pending claims and disputes.
  - 19) Documentation of information for payment requests.
4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.
- a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.
- F. Coordination Meetings: Conduct Project coordination meetings as required. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.
1. Attendees: In addition to representatives of Owner, Owner's Commissioning Authority, and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meetings 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 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 01 3100

## SECTION 01 3200 - CONSTRUCTION PROGRESS DOCUMENTATION

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
  - 1. Contractor's construction schedule.
  - 2. Construction schedule updating reports.
  - 3. Daily construction reports.
  - 4. Site condition reports.
  - 5. Special reports.
- B. Related Requirements:
  - 1. Section 01 3300 "Submittal Procedures" for submitting schedules and reports.
  - 2. Section 01 4000 "Quality Requirements" for submitting a schedule of tests and inspections.

#### 1.2 DEFINITIONS

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

1. See Division of Facilities Construction and Management; General Conditions; Article 4 Contractor; 4.7 Time and Contractor's Construction Schedules; 4.7.7 Float Time.
2. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
3. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
4. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

F. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

### 1.3 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format:

1. Working electronic copy of schedule file, where indicated.
2. PDF electronic file.

B. 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.

C. Construction Schedule Updating Reports: Submit with Applications for Payment.

D. Daily Construction Reports: Submit at monthly intervals.

E. Site Condition Reports: Submit at time of discovery of differing conditions.

F. Special Reports: Submit at time of unusual event.

### 1.4 COORDINATION

A. Coordinate Contractor's construction schedule with the schedule of values, submittal schedule, progress reports, payment requests, and other required schedules and reports.

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

## PART 2 - PRODUCTS

### 2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. See Division of Facilities Construction and Management; General Conditions; Article 4 Contractor; 4.7 Time and Contractor's Construction Schedules; 4.7.5 Schedule Content Requirements.
- B. Time Frame: Extend schedule from date established for the Notice to Proceed 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.
- C. Activities: Treat each story or separate area as a separate numbered activity for each main element of the Work. Comply with the following:
  - 1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
  - 2. Procurement Activities: Include procurement process activities for 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 Section 01 3300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
  - 4. Startup and Testing Time: Include no fewer than 30 days for startup and testing.
  - 5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
  - 6. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and final completion.
- D. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
  - 1. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
  - 2. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Section 01 1000 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
  - 3. 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.
  4. 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. Building flush-out.
    - m. Startup and placement into final use and operation.
  5. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
    - a. Structural completion.
    - b. Temporary enclosure and space conditioning.
    - c. Permanent space enclosure.
    - d. Completion of mechanical installation.
    - e. Completion of electrical installation.
    - f. Substantial Completion.
- E. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion.
  1. Temporary enclosure and space conditioning.
- F. Cost Correlation: Superimpose a cost correlation timeline, indicating planned and actual costs. On the line, show planned and actual dollar volume of the Work performed as of planned and actual dates used for preparation of payment requests.
  1. See Section 01 2900 "Payment Procedures" for cost reporting and payment procedures.
- G. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
  1. Unresolved issues.
  2. Unanswered Requests for Information.
  3. Rejected or unreturned submittals.

4. Notations on returned submittals.
5. Pending modifications affecting the Work and Contract Time.

H. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, and equipment required to achieve compliance, and date by which recovery will be accomplished.

I. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.

## 2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

A. See Division of Facilities Construction and Management; General Conditions; Article 4 Contractor; 4.7 Time and Contractor's Construction Schedules; 4.7.2 Schedule Preparation.

B. General: Prepare network diagrams using AON (activity-on-node) format.

C. CPM Schedule: Prepare Contractor's construction schedule using a cost- and resource-loaded, time-scaled CPM network analysis diagram for the Work.

1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 60 days after date established for the Notice to Proceed.

- a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Architect's approval of the schedule.

2. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.

3. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.

4. Use "one workday" as the unit of time for individual activities. Indicate nonworking days and holidays incorporated into the schedule in order to coordinate with the Contract Time.

D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the startup network diagram, prepare a skeleton network to identify probable critical paths.

1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:

- a. Preparation and processing of submittals.
- b. Mobilization and demobilization.

- c. Purchase of materials.
  - d. Delivery.
  - e. Fabrication.
  - f. Utility interruptions.
  - g. Installation.
  - h. Work by Owner that may affect or be affected by Contractor's activities.
  - i. Testing and commissioning.
  - j. Punch list and final completion.
  - k. Activities occurring following final completion.
2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
  3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
  4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.
    - a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.
- E. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall project schedule.
- F. Initial Issue of Schedule: Prepare initial network diagram from a sorted activity list indicating straight "early start-total float." Identify critical activities. Prepare tabulated reports showing the following:
1. Contractor or subcontractor and the Work or activity.
  2. Description of activity.
  3. Main events of activity.
  4. Immediate preceding and succeeding activities.
  5. Early and late start dates.
  6. Early and late finish dates.
  7. Activity duration in workdays.
  8. Total float or slack time.
  9. Average size of workforce.
  10. Dollar value of activity (coordinated with the schedule of values).
- G. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:
1. Identification of activities that have changed.
  2. Changes in early and late start dates.
  3. Changes in early and late finish dates.
  4. Changes in activity durations in workdays.
  5. Changes in the critical path.

6. Changes in total float or slack time.
7. Changes in the Contract Time.

## 2.3 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 (see 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. Construction Change Directives received and implemented.
  16. Services connected and disconnected.
  17. Equipment or system tests and startups.
  18. Partial completions and occupancies.
  19. Substantial Completions authorized.
- B. 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.

## 2.4 SPECIAL REPORTS

- A. General: Submit special reports directly to Owner 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. See Division of Facilities Construction and Management; General Conditions; Article 4 Contractor; 4.7 Time and Contractor's Construction Schedules; 4.7.2 Schedule Preparation.
- B. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
  - 1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
  - 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
  - 3. As the Work progresses, indicate final completion percentage for each activity.
- C. Distribution: Distribute copies of approved schedule to Architect, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
  - 1. Post copies in Project meeting rooms and temporary field offices.
  - 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 01 3200

## SECTION 01 3300 - SUBMITTAL PROCEDURES

### PART 1 - GENERAL

#### 1.1 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. Section 01 2900 "Payment Procedures" for submitting Applications for Payment and the schedule of values.
  - 2. Section 01 3200 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
  - 3. Section 01 7823 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
  - 4. Section 01 7839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
  - 5. Section 01 7900 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

#### 1.2 DEFINITIONS

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

### 1.3 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 Architect and additional time for handling and reviewing submittals required by those corrections.
1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
  2. Initial Submittal: 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.

### 1.4 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. See Division of Facilities Construction and Management; General Conditions; Article 3 A/E; 3.1 A/E's Administration of the Contract; 3.1.5 A/E Review Contractor's Submittals
- B. See Division of Facilities Construction and Management; General Conditions; Article 4 Contractor; 4.7 Time and Contractor's Construction Schedule; 4.7.10 Schedule of Submittals.
- C. Architect's Digital Data Files: Electronic digital data files of the Contract Drawings will be provided by Architect for Contractor's use in preparing submittals.
1. Architect will furnish Contractor one set of digital data drawing files of the Contract Drawings for use in preparing Shop Drawings and Project record drawings.

- a. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
  - b. Digital Drawing Software Program: The Contract Drawings are available in AutoCad 12.
  - c. Contractor shall execute a data licensing agreement in the form of Agreement form acceptable to Owner and Architect.
- D. 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. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- E. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
1. Initial Review: Allow 21 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
  2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
  3. Resubmittal Review: Allow 21 days for review of each resubmittal.
  4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 30 days for initial review of each submittal.
- F. 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., LNHS-061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., LNHS-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 acceptable to Owner, containing the following information:
    - a. Project name.
    - b. Date.
    - c. Name and address of Architect.
    - d. Name of Contractor.
    - 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.
  5. Metadata: Include the following information as keywords in the electronic submittal file metadata:
    - a. Project name.
    - b. Number and title of appropriate Specification Section.
    - c. Manufacturer name.
    - d. Product name.
- G. Options: Identify options requiring selection by Architect.
- H. 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.
- I. 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.

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

## 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. Post electronic submittals as PDF electronic files directly Document Transfer site for Project.
    - a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
  - 2. Submit electronic submittals via email as PDF electronic files.
    - a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
  - 3. 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.
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.
- 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. Architect 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. Architect will retain two Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a project record sample.
      - 1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
      - 2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.
- E. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
  2. Manufacturer and product name, and model number if applicable.
  3. Number and name of room or space.
  4. Location within room or space.
  5. Submit product schedule in the following format:
    - a. PDF electronic file.
- F. Coordination Drawing Submittals: Comply with requirements specified in Section 01 3100 "Project Management and Coordination."
- G. Contractor's Construction Schedule: Comply with requirements specified in Section 01 3200 "Construction Progress Documentation."
- H. Application for Payment and Schedule of Values: Comply with requirements specified in Section 01 2900 "Payment Procedures."
- I. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Section 01 4000 "Quality Requirements."
- J. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 01 7700 "Closeout Procedures."
- K. Maintenance Data: Comply with requirements specified in Section 01 7823 "Operation and Maintenance Data."
- L. LEED Submittals: Comply with requirements for LEED for New Construction and Major Renovations specified in Section 01 8113 "Sustainable Design Requirements."
- M. 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.
- N. 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.
- O. 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.
- P. 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.
- Q. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

- R. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- S. 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.
- T. 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.
- U. 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.
- V. 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.
- W. 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.
- X. 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.
- Y. 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 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. See Division of Facilities Construction and Management; General Conditions; Article 4 Contractor; 4.9 Shop Drawings, Product Data and Samples; 4.9.4 Representations by Contractor.
- B. 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.
- C. Project Closeout and Maintenance Material Submittals: See requirements in Section 01 7700 "Closeout Procedures."
- D. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

#### 3.2 ARCHITECT'S ACTION

- A. See Division of Facilities Construction and Management; General Conditions; Article 3 A/E; 3.1 A/E's Administration of the Contract; 3.1.5 A/E Review Contractor's Submittals.
- B. See Division of Facilities Construction and Management; General Conditions; Article 4 Contractor; 4.9 Shop Drawings, Product Data and Samples; 4.9.6 Direct Specific Attention to Revisions.
- C. Action Submittals: Architect will review each submittal, make marks to indicate corrections or revisions required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.

- D. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
- E. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.
- F. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- G. Submittals not required by the Contract Documents may be returned by the Architect without action.

END OF SECTION 01 3300

## SECTION 01 4000 - QUALITY REQUIREMENTS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. See Division of Facilities Construction and Management; General Conditions; Article 9 Tests and Inspections, Substantial and Final Completion, Uncovering, Correction of Work and Guaranty Period; 9.1 Tests and Inspection; 9.1.1 in General.

#### 1.2 SUMMARY

- A. Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
  - 1. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
  - 2. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, Commissioning Authority, or authorities having jurisdiction are not limited by provisions of this Section.
- C. Related Requirements:
  - 1. Divisions 02 through 33 Sections for specific test and inspection requirements.

#### 1.3 DEFINITIONS

- A. See Division of Facilities Construction and Management; General Conditions; Article 2 DFCM; 2.1 Information and Services Required of the DFCM; 2.1.2 Specialists and Inspectors.
- B. 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.
- C. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.

- D. 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.
  - 1. Laboratory Mockups: Full-size physical assemblies constructed at testing facility to verify performance characteristics.
- E. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.
- F. 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 specified requirements.
- G. Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.
- H. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- I. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- J. 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. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).
- K. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

#### 1.4 CONFLICTING REQUIREMENTS

- A. Referenced Standards: 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 conflicting 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 INFORMATIONAL SUBMITTALS

- A. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility sent to authorities having jurisdiction before starting work on the following systems:
  - 1. Seismic-force-resisting system, designated seismic system, or component listed in the designated seismic system quality-assurance plan prepared by Architect.
  - 2. Main wind-force-resisting system or a wind-resisting component listed in the wind-force-resisting system quality-assurance plan prepared by Architect.
- B. 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.

#### 1.6 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 Field Reports: Prepare written information documenting tests and inspections specified in other Sections. Include the following:
  - 1. Name, address, and telephone number of representative making report.

2. Statement on condition of substrates and their acceptability for installation of product.
  3. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
  4. Results of operational and other tests and a statement of whether observed performance complies with requirements.
  5. Other required items indicated in individual Specification Sections.
- C. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

### 1.7 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.
- F. Specialists: Certain Specification Sections 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. Requirements of authorities having jurisdiction shall supersede requirements for specialists.
- 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 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. 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.
  2. Notify Architect and testing agency seven days in advance of dates and times when mockups will be constructed.
  3. Demonstrate the proposed range of aesthetic effects and workmanship.
  4. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
    - a. Allow seven days for initial review and each re-review of each mockup.

#### 1.8 QUALITY CONTROL

- A. See Division of Facilities Construction and Management; General Conditions; Article 2 DFCM; 2.1 Information and Services Required of the DFCM; 2.1.2 Specialists and Inspectors
- B. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
  1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
  2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.
- C. 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. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
    - a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
  2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
  3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.

4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
  5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- D. **Manufacturer's Field Services:** Where indicated, engage a manufacturer's representative to observe and inspect the Work. Manufacturer's representative's services include examination of substrates and conditions, verification of materials, 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 Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
  2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
  3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
  4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
  5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
  6. Do not perform any duties of Contractor.
- 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.

#### 1.9 SPECIAL TESTS AND INSPECTIONS

- A. See Division of Facilities Construction and Management; General Conditions; Article 2 DFCM; 2.1 Information and Services Required of the DFCM; 2.1.2 Specialists and Inspectors.
- B. Special Tests and Inspections: Owner will Engage a qualified testing agency or special inspector to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, and as follows:
  1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviews the completeness and adequacy of those procedures to perform the Work.
  2. Notifying Architect, Commissioning Authority, and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
  3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect and Commissioning Authority with copy to Contractor and to authorities having jurisdiction.
  4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
  5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
  6. Retesting and reinspecting corrected work.

#### 1.10 MOCK-UP PROVISIONS

- A. Prepare mock-ups for Work specifically requested in specifications. Include work for Sections required to provide mock-ups.
- B. Construct in locations indicated.
- C. Prepare mock-ups for Architect, Commissioning Agent, and Testing Agency review in reasonable promptness and in orderly sequence, to not cause delays of Work.
- D. Failure to prepare mock-ups in ample time is not considered sufficient reason for extension of Contract time and no claim for extension by reason of such default will be allowed.

#### 1.11 ENVELOPE MOCK-UP TESTING

- A. Construct and test mock-up prior to commencement of installation of building envelope components. Construct mock-up free-standing, at site but not on the building. Provide two separate mock-ups, one for each building. Mock-up will be tested prior to installation of exterior insulation and cladding. Install all penetrations through air barrier prior to testing e.g. masonry ties, metal panel girts, fasteners, etc. Do not install any interior finishes prior to either phase of mock-up testing. Include in mock-up, a junction with the roofing membrane, a building corner condition, and foundation wall intersection. Employ in mock-up no less than 100 sq. ft. of

opaque wall and a fenestration assembly. For certain building components that are not included in the free standing mock-up, separate mini mock-ups that are the first installed on the building to remain are acceptable.

- B. Allow 48 hours for review by Architect, Commissioning Agent, and Testing Agency before proceeding with air barrier work.
- C. Coordinate and complete mock-ups construction and chamber. Construct and repair test chamber as necessary to create an air-tight chamber. Construct mock-up of wood or steel framing, exterior sheathing, and a sheet applied air barrier. Prior to testing, the Testing Agency will pressurize the test chamber while simultaneously supplying smoke to the chamber. Any voids in the chamber air barrier will be identified and sealed to create an air-tight chamber. Permit inspections of the mock-up to the Building Envelope Commissioning Agent, Testing Agency, and any member of the building envelope commissioning team throughout construction and testing as required.
- D. If Architect, Commissioning Agent, or Testing Agency determines that mockups do not comply with requirements, reconstruct mockups and apply air barrier until mockups are approved.
- E. Mockup Testing: Air barrier assemblies shall comply with performance requirements indicated, as evidenced by reports based on mockup testing by a qualified testing agency acceptable to the Authority.
  - 1. ASTM E 1186- Chamber Pressurization or Depressurization in Conjunction With Smoke Tracers:
    - a. Qualitative air in/exfiltration test, used to identify the location of air leaks. Practice utilizes airtight chamber to create a pressure differential across air barrier specimen (negative pressure outside). If smoke tracer source is moved over surface of test specimen on higher pressure side (interior), air leakage will draw smoke toward an air leakage site, visually indicating the location. Leaks through mock-up chamber must be sealed prior to commencing ASTM E 783 testing.
    - b. After ASTM E 1186, it will be clear as to whether the exterior chamber is functioning properly and if there is significant in/exfiltration through the building envelope. If there are leaks, test allows contractor to focus on location of air leaks. Pass criteria shall be absence of major air leaks. A major air leak is defined as air and smoke are visible and easily detectable by hand within one inch of the leak location(s). Once it is clear that the chamber and mock-up are performing sufficiently, the following tests can continue:
  - 2. ASTM E 783- Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors:
    - a. Quantitative air ex/infiltration test. Use same airtight chamber used for ASTM E 1186. Air is supplied to chamber within range of pressure differentials. The airflow required to maintain that pressure differential is equal to the air leakage out of enclosure. If air leakage rate of system meets project specifications, system passes. Test will be conducted where air is exhausted from chamber to create a

range of negative pressure differentials. Additional air exhausted from chamber to maintain negative pressure differential is equal to air leakage into enclosure. Measured air flow through fenestration assemblies shall not exceed 0.06 cfm/sq.ft. when tested under pressure difference of 6.24 lbf/sq. ft.. Measured air flow through air barrier assemblies shall not exceed 0.04 cfm/sq.ft. when tested under a pressure difference of 1.57 lbf/sq. ft.

3. ASTM E 1105, Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference:
    - a. Pass/fail criteria: No uncontrolled water leakage when tested under a pressure difference of 8.00 lbf/sq. ft. as defined in the above test methods.
  4. AAMA 501.1, Standard Test Method for Water Penetration of Windows, Curtain Walls and Doors Using Dynamic Pressure:
    - a. Water penetration testing consists of utilizing a portable wind generator equipped with a water system. For on-site use, an extended forklift is required to position machine at elevations above ground level.
    - b. Pass/fail criteria: No uncontrolled water leakage when tested under pressure difference of 8.0 lbf/sq. ft.
- F. Field Testing: The following field testing shall be performed. Locations of field testing shall be at areas deemed most critical by project team. Unless otherwise specified, the amount of testing is the total amount for both buildings.
1. ASTM E 1186-03, Standard Practices for Air Leakage Site Detection in Building Envelopes and Air Barrier Systems, method 4.2.6
    - a. Use chamber depressurization and site detection liquid at penetrations through the air barrier (e.g. masonry tie fastener penetrations). Pass/fail criteria shall be no bubbles observed in the leak detection liquid. A minimum of 15 locations at each building shall be tested.
  2. ASTM E 1186-03, Standard Practices for Air Leakage Site Detection in Building Envelopes and Air Barrier Systems, method 4.2.7:
    - a. Use pressurization and smoke tracers to identify leak locations through the test specimen. Pass/fail criteria shall be no major air leaks. A major leak is defined as air and smoke are visible and easily detectable by hand within one inch of the leak location(s). A minimum of 8 locations at each building shall be tested.
  3. AAMA 501.1, Standard Test Method for Water Penetration of Windows, Curtain Walls and Doors using Dynamic Pressure:
    - a. Pass/fail criteria shall be no uncontrolled water leakage when tested under a pressure difference of 8.0 lbf/sq. ft.. A minimum of 10 locations at each building shall be tested.

4. ASTM D 4541-09, Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers:
    - a. Measured air barrier adhesion strength shall not be less than 16 lbf/sq. inch as identified in Project Specification Section 07 2727. Testing performed at a minimum of 4 randomly selected areas.
  5. ASTM E 783- Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors:
    - a. Quantitative air testing of at least one opaque wall and one fenestration assembly. Maximum air leakage of 0.04 cfm/sqft at an air pressure differential of 1.57 psf for air barrier assemblies and a maximum air leakage of 0.09 cfm at an air pressure differential of 6.24 psf for fenestration.
  6. ASTM E 779, Standard Test Method for Determining Air Leakage Rate by Fan Pressurization:
    - a. Whole building air testing and thermography with maximum air leakage rate of 0.25 cfm/sqft.
- G. All failed test locations should be retested until successful results are achieved. The Owner reserves the right to add an additional test specimen for each failed test. All cost associated with repairs and retesting are the responsibility of the Contractor.

## PART 2 - PRODUCTS (Not Used)

## PART 3 - EXECUTION

### 3.1 TEST AND INSPECTION LOG

- A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:
  1. Date test or inspection was conducted.
  2. Description of the Work tested or inspected.
  3. Date test or inspection results were transmitted to Architect.
  4. Identification of testing agency or special inspector conducting test or inspection.
- B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's, Commissioning Authority'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 or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 01 7300 "Execution."
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 01 4000

## SECTION 01 5000 - TEMPORARY FACILITIES AND CONTROLS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
- B. Related Requirements:
  - 1. Section 01 1000 "Summary" for work restrictions and limitations on utility interruptions.
  - 2. Section 32 1216 "Asphalt Paving" for construction and maintenance of asphalt pavement for temporary roads and paved areas.

#### 1.2 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, Architect, testing agencies, and authorities having jurisdiction.
- B. Sewer Service: Owner will pay metered sewer-service use charges for sewer usage by all entities for construction operations.
- C. Water Service: Owner will pay metered water-service use charges for water used by all entities for construction operations.
- D. Electric Power Service: Owner will pay metered electric-power-service use charges for electricity used by all entities for construction operations.

#### 1.3 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. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.
- D. Moisture-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage.

1. Describe delivery, handling, and storage provisions for materials subject to water absorption or water damage.
  2. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water-damaged Work.
  3. 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.
- E. Dust- and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust- and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. 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 work.
  2. HVAC system isolation schematic drawing.
  3. Location of proposed air-filtration system discharge.
  4. Waste handling procedures.
  5. Other dust-control measures.

#### 1.4 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.
- C. Accessible Temporary Egress: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

#### 1.5 PROJECT CONDITIONS

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

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Chain-Link Fencing: Minimum 2-inch, 0.148-inch- thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch- OD line posts and 2-7/8-inch- OD corner and pull posts, with 1-5/8-inch- OD top rails.
- B. 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.
- C. Dust-Control Adhesive-Surface Walk-off Mats: Provide mats minimum 36 by 60 inches.
- D. 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 Owner, Architect, and construction personnel office activities and to accommodate Project meetings specified in other Division 01 Sections. Keep office clean and orderly. Furnish and equip offices as follows:
  - 1. Furniture required for Project-site documents including file cabinets, plan tables, plan racks, and bookcases.
  - 2. Conference room of sufficient size to accommodate meetings of 10 individuals. Provide electrical power service and 120-V ac duplex receptacles, with no fewer than one receptacle on each wall. Furnish room with conference table, chairs, and 4-foot- square tack and marker boards.
  - 3. Drinking water and private toilet.
  - 4. Coffee machine and supplies.
  - 5. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F.
  - 6. 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: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
  - 1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
  - 2. Heating Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.
  - 3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return-air grille in system and remove at end of construction and clean HVAC system as required in Section 01 7700 "Closeout Procedures".
- 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.
- 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.
  - 2. Install meters for measuring use of power, water, and gas.
- B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
  - 1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.
- C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.
- D. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

- E. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
- F. 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.
- G. 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 or underground unless otherwise indicated.
- H. 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.
- I. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install one telephone line(s) for each field office.
  - 1. Provide additional telephone lines for the following:
    - a. Provide a dedicated telephone line for each facsimile machine in each field office.
  - 2. At each telephone, post a list of important telephone numbers.
    - a. Police and fire departments.
    - b. Ambulance service.
    - c. Contractor's home office.
    - d. Contractor's emergency after-hours telephone number.
    - e. Architect's office.
    - f. Engineers' offices.
    - g. Owner's office.
    - h. Principal subcontractors' field and home offices.
  - 3. Provide superintendent with cellular telephone or portable two-way radio for use when away from field office.
- J. Electronic Communication Service: Provide a desktop computer in the primary field office adequate for use by Architect and Owner to access Project electronic documents and maintain electronic communications. Equip computer with not less than the following:

1. Processor: Intel Pentium D or Intel CoreDuo, 3.0 GHz processing speed.
2. Memory: 4 gigabyte.
3. Disk Storage: 300 gigabyte hard-disk drive and combination DVD-RW/CD-RW drive.
4. Display: 22-inch LCD monitor with 256-Mb dedicated video RAM.
5. Full-size keyboard and mouse.
6. Network Connectivity: 10/100BaseT Ethernet.
7. Operating System: Microsoft Windows XP Professional or Microsoft Windows Vista Business.
8. Productivity Software:
  - a. Microsoft Office Professional, XP or higher, including Word, Excel, and Outlook.
  - b. Adobe Reader 7.0 or higher.
  - c. WinZip 7.0 or higher.
9. Printer: "All-in-one" unit equipped with printer server, combining color printing, photocopying, scanning, and faxing, or separate units for each of these three functions.
10. Internet Service: Broadband modem, router and ISP, equipped with hardware firewall, providing minimum 384 Kbps upload and 1 Mbps download speeds at each computer.
11. Internet Security: Integrated software, providing software firewall, virus, spyware, phishing, and spam protection in a combined application.
12. Backup: External hard drive, minimum 40 gigabyte, with automated backup software providing daily backups.

### 3.3 SUPPORT FACILITIES INSTALLATION

#### A. General: Comply with the following:

1. Provide construction for temporary offices, shops, and sheds located within construction area or within 30 feet of building lines that is noncombustible according to ASTM E 136. Comply with NFPA 241.
2. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

#### B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas within construction limits indicated on Drawings.

#### C. Temporary Use of Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.

1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
2. Prepare subgrade and install subbase and base for temporary roads and paved areas according to Section 31 2000 "Earth Moving."

3. Recondition base after temporary use, including removing contaminated material, regrading, proofrolling, compacting, and testing.
- D. 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.
  3. Access Routes: Provide traffic plan that describes access routes for concrete trucks, delivery trucks, and other vehicles.
- E. Parking: Use designated areas of Owner's existing parking areas for construction personnel.
- F. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
  2. Remove snow and ice as required to minimize accumulations.
- G. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
1. Identification Signs: Provide Project identification signs as indicated on Drawings provided by Architect.
    - a. Engage an experienced sign painter to apply graphics for Project identification signs. Comply with details indicated.
  2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
    - a. Provide temporary, directional signs for construction personnel and visitors.
  3. Maintain and touchup signs so they are legible at all times.
- H. Waste Disposal Facilities: Comply with requirements specified in Section 01 7419 "Construction Waste Management and Disposal."
- I. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.
- J. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.
- K. Temporary Use of Permanent Stairs: Use of new stairs for construction traffic will be permitted, provided stairs are protected and finishes restored to new condition at time of Substantial Completion.

### 3.4 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 as required to 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 Section 011000 "Summary."
- C. Temporary Erosion and Sedimentation Control: Comply with requirements of 2003 EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent and requirements specified in Section 31 1000 "Site Clearing."
- D. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
- E. Tree and Plant Protection: Comply with requirements specified.
- F. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using environmentally safe materials.
- G. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.
  - 1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.
  - 2. Maintain security by limiting number of keys and restricting distribution to authorized personnel.
- H. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each work day.
- I. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- J. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.
- K. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.

1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.
- L. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.
1. Prohibit smoking in construction areas.
  2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
  3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
  4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

### 3.5 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. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.
  - a. 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 roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
  3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 01 7700 "Closeout Procedures."

END OF SECTION 01 5000

## SECTION 01 5639 - TREE PROTECTION

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes the protection and trimming of trees that interfere with, or are affected by, execution of the Work, whether temporary or new construction.
- B. Related Sections include the following:
  - 1. Division 01 Section "Summary of Work" for limits placed on Contractor's use of the site.
  - 2. Division 01 Section "Temporary Facilities and Controls" for temporary tree protection.
  - 3. Division 31 Section "Earthwork" for building and utility trench excavation, backfilling, compacting and grading requirements, and soil materials.
  - 4. Division 31 Section "Site Clearing" for removal limits of trees, shrubs, and other plantings affected by new construction.
  - 5. Division 32 Section "Landscape Planting" for tree and shrub planting and transplanting, tree support systems, and soil materials.

#### 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- C. Certification: A qualified arborist shall certify that trees indicated to remain have been protected during all phases of construction according to recognized standards and those trees were promptly and properly treated and repaired when damaged.
- D. Maintenance Recommendations: A qualified arborist shall submit maintenance recommendations for care and protection of trees affected by construction during and after completing the Work.

#### 1.4 QUALITY ASSURANCE

- A. Tree Service Qualifications: An experienced tree service firm that has successfully completed tree protection and trimming work similar to that required for this Project and that will assign an experienced, qualified arborist to Project site during execution of the Work.
- B. Arborist Qualifications: An arborist certified by the International Society of Arboriculture or licensed in the jurisdiction where Project is located.
- C. Tree Pruning Standards: Comply with ANSI A300, "Trees, Shrubs, and Other Woody Plant Maintenance--Standard Practices," unless more stringent requirements are indicated.
- D. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Meetings."
  - 1. Before starting tree protection and trimming, meet with representatives of authorities having jurisdiction, Owner, Architect, consultants, and other concerned entities. Review tree protection and trimming procedures and responsibilities. Notify participants at least three working days before convening conference. Record discussions and agreements and furnish a copy to each participant.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Drainage Fill: Selected crushed stone, or crushed or uncrushed gravel, washed, ASTM D 448, Size 24, with 90 to 100 percent passing a 2-1/2-inch sieve and not more than 10 percent passing a 3/4-inch sieve.
- B. Topsoil: Fertile, friable, surface soil, containing natural loam and complying with Division 02 Section "Landscape Planting" for Soils.
- C. Filter Fabric: Manufacturer's standard, nonwoven, pervious, geotextile fabric of polypropylene, nylon, or polyester fibers.
- D. Chain Link Fence: Metallic-coated steel chain link fence fabric, 0.120-inch-diameter wire size; 48 inches high, minimum; line posts, 1.9 inches in diameter; terminal and corner posts, 2-3/8 inches in diameter; top rail, 1-5/8 inches in diameter; bottom tension wire, 0.177 inch in diameter; with tie wires, hog ring ties, and other accessories for a complete fence system.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Temporary Fencing: Install temporary fencing located as indicated or outside the drip line of trees to protect remaining vegetation from construction damage. As indicated on the Drawings. Contractor to meet with the Landscape Architect and Arborist to define specific fencing locations for this project during phases of construction.

1. Install chain link fence according to ASTM F 567 and manufacturer's written instructions.
- B. Protect tree root systems from damage due to noxious materials caused by runoff or spillage while mixing, placing, or storing construction materials. Protect root systems from flooding, eroding, or excessive wetting caused by dewatering operations.
- C. Do not store construction materials, debris, or excavated material within the drip line of remaining trees. Do not permit vehicles or foot traffic within the drip line; prevent soil compaction over root systems.
- D. Do not allow fires under or adjacent to remaining trees or other plants.

### 3.2 EXCAVATION

- A. Install shoring or other protective support systems to minimize sloping or benching of excavations.
- B. Do not excavate within drip line of trees, unless otherwise indicated.
- C. Where excavation for new construction is required within drip line of trees, hand clear and excavate to minimize damage to root systems. Use narrow-tine spading forks and comb soil to expose roots.
  1. Relocate roots in backfill areas where possible. If encountering large, main lateral roots, expose roots beyond excavation limits as required to bend and relocate them without breaking. If encountered immediately adjacent to location of new construction and relocation is not practical, cut roots approximately 3 inches back from new construction.
  2. Do not allow exposed roots to dry out before placing permanent backfill. Provide temporary earth cover or pack with peat moss and wrap with burlap. Water and maintain in a moist condition. Temporarily support and protect roots from damage until they are permanently relocated and covered with soil.
- D. Where utility trenches are required within drip line of trees, tunnel under or around roots by drilling, auger boring, pipe jacking, or digging by hand.

### 3.3 RE-GRADING

- A. Grade Lowering: Where new finish grade is indicated below existing grade around trees, slope grade beyond drip line of trees. Maintain existing grades within drip line of trees.
- B. Grade Lowering: Where new finish grade is indicated below existing grade around trees, slope grade away from trees as recommended by qualified arborist, unless otherwise indicated.
  1. Root Pruning: Prune tree roots exposed during grade lowering. Do not cut main lateral roots or taproots; cut only smaller roots. Cut roots with sharp pruning instruments; do not break or chop.

- C. Minor Fill: Where existing grade is 6 inches or less below elevation of finish grade, fill with topsoil. Place topsoil in a single uncompacted layer and hand grade to required finish elevations.
- D. Moderate Fill: Where existing grade is more than 6 inches but less than 12 inches, below elevation of finish grade, place drainage fill, filter fabric, and topsoil on existing grade as follows:
  - 1. Carefully place drainage fill against tree trunk approximately 2 inches above elevation of finish grade and extend not less than 18 inches from tree trunk on all sides. For balance of area within drip-line perimeter, place drainage fill up to 6 inches below elevation of grade.
  - 2. Place filter fabric with edges overlapping 6 inches minimum.
  - 3. Place fill layer of topsoil to finish grade. Do not compact drainage fill or topsoil. Hand grade to required finish elevations.

### 3.4 TREE PRUNING

- A. Prune remaining trees affected by temporary and new construction.
- B. Prune remaining trees to compensate for root loss caused by damaging or cutting root system. Provide subsequent maintenance during Contract period as recommended by qualified arborist.
- C. Pruning Standards: Prune trees according to ANSI A300 as follows:
  - 1. Type of Pruning: Crown cleaning.
  - 2. Type of Pruning: Crown thinning.
  - 3. Type of Pruning: Crown raising.
  - 4. Type of Pruning: Crown reduction.
  - 5. Type of Pruning: Vista pruning.
  - 6. Type of Pruning: Crown restoration.
- D. Cut branches with sharp pruning instruments; do not break or chop.
- E. Chip branches removed from trees. Spread chips where indicated or as directed by the Landscape Architect.

### 3.5 TREE REPAIR AND REPLACEMENT

- A. Promptly repair trees damaged by construction operations within 24 hours. Treat damaged trunks, limbs, and roots according to written instructions of the qualified arborist.
- B. Remove and replace dead and damaged trees that the qualified arborist determines to be incapable of restoring to a normal growth pattern.
  - 1. Provide new trees of the same size and species as those being replaced; plant and maintain as specified in Division 02 Section "Landscape Planting."
  - 2. Provide new trees of 6-inch caliper size and of a species selected by Owner's Representative when trees more than 6 inches in caliper size, measured 12 inches above grade, are required to be replaced.

- C. Aerate surface soil, compacted during construction, 10 feet beyond drip line and no closer than 36 inches to tree trunk. Drill 2-inch-diameter holes a minimum of 12 inches deep at 24 inches o.c. Backfill holes with an equal mix of augered soil and sand.

### 3.6 DISPOSAL OF WASTE MATERIALS

- A. Burning is not permitted.
- B. Disposal: Remove excess excavated material, displaced trees, and excess chips from Owner's property.

END OF SECTION 01 5639

## SECTION 01 6000 - PRODUCT REQUIREMENTS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.
- B. Related Requirements:
  - 1. Section 01 2500 "Substitution Procedures" for requests for substitutions.

#### 1.2 DEFINITIONS

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

#### 1.3 ACTION SUBMITTALS

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

1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

- a. Form of Approval: As specified in Section 01 3300 "Submittal Procedures."
- b. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.

- B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 01 3300 "Submittal Procedures." Show compliance with requirements.

#### 1.4 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product 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, Architect will determine which products shall be used.

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

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

- B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to determine compliance with the Contract Documents and to determine 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. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
6. Protect stored products from damage and liquids from freezing.
7. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

#### 1.6 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
  2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
  2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
  3. See other Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Section 01 7700 "Closeout Procedures."

### PART 2 - PRODUCTS

#### 2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.

2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Architect will make selection.
5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
6. Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," comply with requirements in "Comparable Products" 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. Comparable products or 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. Comparable products or 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. Comparable products or 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 "Comparable Products" Article 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 "Comparable Products" Article for consideration of an unnamed manufacturer's product.
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 "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

- C. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
  - 1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 012500 "Substitution Procedures" for proposal of product.
- D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

## 2.2 COMPARABLE PRODUCTS

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

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 6000

## SECTION 01 7300 - EXECUTION

### PART 1 - GENERAL

#### 1.1 SUMMARY

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

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

- B. Related Requirements:

1. Section 01 1000 "Summary" for limits on use of Project site.
2. Section 01 3300 "Submittal Procedures" for submitting surveys.
3. Section 01 7700 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.
4. Section 02 4119 "Selective Demolition" for demolition and removal of selected portions of the building.
5. Section 07 8413 "Penetration Firestopping" for patching penetrations in fire-rated construction.

#### 1.2 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.

#### 1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For land surveyor.
- B. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.

- C. Cutting and Patching Plan: Submit plan describing procedures at least 10 days prior to the time cutting and patching will be performed. Include the following information:
  - 1. Extent: Describe reason for and extent of each occurrence of cutting and patching.
  - 2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
  - 3. Products: List products to be used for patching and firms or entities that will perform patching work.
  - 4. Dates: Indicate when cutting and patching will be performed.
  - 5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.
    - a. Include description of provisions for temporary services and systems during interruption of permanent services and systems.
- D. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.
- E. Certified Surveys: Submit two copies signed by land surveyor.
- F. Final Property Survey: Submit 10 copies showing the Work performed and record survey data.

#### 1.4 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.
- B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
  - 1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.
  - 2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
  - 3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
  - 4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner

that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

- C. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.
- D. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections.
  - 1. For projects requiring compliance with sustainable design and construction practices and procedures, use products for patching that comply with requirements LEED for New Construction and Major Renovations" specified in Section 01 8113 "Sustainable Design Requirements."
- B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
  - 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials.

## 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. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

### 3.2 PREPARATION

- A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Section 01 3100 "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 Architect promptly.
- B. General: Engage a land surveyor 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 limits on use of Project site.

3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
  4. Inform installers of lines and levels to which they must comply.
  5. Check the location, level and plumb, of every major element as the Work progresses.
  6. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
  7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.
- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

### 3.4 FIELD ENGINEERING

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

- D. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.
- E. Final Property Survey: Engage a land surveyor to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.
  - 1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.
  - 2. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

### 3.5 INSTALLATION

- A. 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. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.
- F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with

other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
  2. Allow for building movement, including thermal expansion and contraction.
  3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- J. 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. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.
- C. Temporary Support: Provide temporary support of work to be cut.
- D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching according to requirements in Section 01 1000 "Summary."
- F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.
- G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
  2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
  3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
  4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
  5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
  6. Proceed with patching after construction operations requiring cutting are complete.
- H. 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 and ensures thermal and moisture integrity of building enclosure.
- I. 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. See Division of Facilities Construction and Management; General Conditions; Article 4 Contractor; 4.10 Use of Site; 4.10.1 In General
- B. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
  - 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
  - 2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
  - 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
    - a. Use containers intended for holding waste materials of type to be stored.
  - 4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.
- C. Site: Maintain Project site free of waste materials and debris.
- D. 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.
- 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 Section 01 7419 "Construction Waste Management and Disposal."
- 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. Coordinate startup and adjusting of equipment and operating components with requirements in Section 01 9113 "General Commissioning Requirements."
- B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- E. Manufacturer's Field Service: Comply with qualification requirements in Section 01 4000 "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.

END OF SECTION 01 7300

## SECTION 01 7419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section includes administrative and procedural requirements for the following:

1. Salvaging nonhazardous construction waste.
2. Recycling nonhazardous construction waste.
3. Disposing of nonhazardous construction waste.

B. Related Requirements:

1. Section 31 1000 "Site Clearing" for disposition of waste resulting from site clearing and removal of above- and below-grade improvements.
2. Section 04 Masonry sections for disposal requirements for masonry waste.

#### 1.2 DEFINITIONS

- A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- B. Disposal: Removal off-site of construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.
- C. Recycle: Recovery of construction waste for subsequent processing in preparation for reuse.
- D. Salvage and Reuse: Recovery of construction waste and subsequent incorporation into the Work.

#### 1.3 PERFORMANCE REQUIREMENTS

- A. General: Achieve end-of-Project rates for salvage/recycling of 75 percent by weight of total non-hazardous solid waste generated by the Work. Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials.

#### 1.4 ACTION SUBMITTALS

- A. Waste Management Plan: Submit plan within 30 days of date established for commencement of the Work.

## 1.5 INFORMATIONAL SUBMITTALS

- A. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit report. Use Form CWM-7 for construction waste. Include the following information:
  - 1. Material category.
  - 2. Generation point of waste.
  - 3. Total quantity of waste in tons.
  - 4. Quantity of waste salvaged, both estimated and actual in tons.
  - 5. Quantity of waste recycled, both estimated and actual in tons.
  - 6. Total quantity of waste recovered (salvaged plus recycled) in tons.
  - 7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.
- B. Waste Reduction Calculations: Before request for Substantial Completion, submit calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.
- C. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- D. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- E. LEED Submittal: LEED letter template for Credit MR 2, signed by Contractor, tabulating total waste material, quantities diverted and means by which it is diverted, and statement that requirements for the credit have been met.
- F. Qualification Data: For waste management coordinator.

## 1.6 QUALITY ASSURANCE

- A. Waste Management Coordinator Qualifications: Experienced firm, with a record of successful waste management coordination of projects with similar requirements, that employs a LEED-Accredited Professional, certified by the USGBC, as waste management coordinator. Waste management coordinator may also serve as LEED coordinator.
- B. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.
- C. Waste Management Conference: Conduct conference at Project site to comply with requirements in Section 01 3100 "Project Management and Coordination." Review methods and procedures related to waste management including, but not limited to, the following:
  - 1. Review and discuss waste management plan including responsibilities of waste management coordinator.

2. Review requirements for documenting quantities of each type of waste and its disposition.
3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
5. Review waste management requirements for each trade.

#### 1.7 WASTE MANAGEMENT PLAN

- A. General: Develop a waste management plan according to ASTM E 1609 and requirements in this Section. Plan shall consist of waste identification, waste reduction work plan, and cost/revenue analysis. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.
- B. Waste Identification: Indicate anticipated types and quantities of site-clearing and construction waste generated by the Work. Use Form CWM-1 for construction waste. Include estimated quantities and assumptions for estimates.
- C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Use Form CWM-3 for construction waste. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.
  1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
  2. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
  3. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
  4. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
  5. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
  6. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location where materials separation will be performed.
- D. Cost/Revenue Analysis: Indicate total cost of waste disposal as if there was no waste management plan and net additional cost or net savings resulting from implementing waste management plan. Use Form CWM-5 for construction waste. Include the following:
  1. Total quantity of waste.
  2. Estimated cost of disposal (cost per unit). Include hauling and tipping fees and cost of collection containers for each type of waste.
  3. Total cost of disposal (with no waste management).
  4. Revenue from salvaged materials.

5. Revenue from recycled materials.
6. Savings in hauling and tipping fees by donating materials.
7. Savings in hauling and tipping fees that are avoided.
8. Handling and transportation costs. Include cost of collection containers for each type of waste.
9. Net additional cost or net savings from waste management plan.

## PART 2 - PRODUCTS (Not Used)

## PART 3 - EXECUTION

### 3.1 PLAN IMPLEMENTATION

- A. General: Implement waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
  1. Comply with operation, termination, and removal requirements in Section 01 5000 "Temporary Facilities and Controls."
- B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan.
- C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work.
  1. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.
- D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
  1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
  2. Comply with Section 01 5000 "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

### 3.2 RECYCLING CONSTRUCTION WASTE, GENERAL

- A. General: Recycle paper and beverage containers used by on-site workers.
- B. Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Owner.

- C. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall be shared equally by Owner and Contractor.
- D. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.
- E. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.
  - 1. Provide appropriately marked containers or bins for controlling recyclable waste until removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
    - a. Inspect containers and bins for contamination and remove contaminated materials if found.
  - 2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
  - 3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
  - 4. Store components off the ground and protect from the weather.
  - 5. Remove recyclable waste from Owner's property and transport to recycling receiver or processor.

### 3.3 RECYCLING CONSTRUCTION WASTE

#### A. Packaging:

- 1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
- 2. Polystyrene Packaging: Separate and bag materials.
- 3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
- 4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

#### B. Wood Materials:

- 1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
- 2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.

#### C. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location.

1. Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.

### 3.4 DISPOSAL OF WASTE

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

### 3.5 ATTACHMENTS

- A. Form CWM-1 for construction waste identification.
- B. Form CWM-3 for construction waste reduction work plan.
- C. Form CWM-5 cost/revenue analysis of construction waste reduction work plan.
- D. Form CWM-7 for construction waste

END OF SECTION 01 7419

FORM CWM-1: CONSTRUCTION WASTE IDENTIFICATION							
MATERIAL CATEGORY	GENERATION POINT	EST. QUANTITY OF MATERIALS RECEIVED* (A)	EST. WASTE - % (B)	TOTAL EST. QUANTITY OF WASTE* (C = A x B)	EST. VOLUME CY (CM)	EST. WEIGHT TONS (TONNES)	REMARKS AND ASSUMPTIONS
Packaging: Cardboard							
Packaging: Boxes							
Packaging: Plastic Sheet or Film							
Packaging: Polystyrene							
Packaging: Pallets or Skids							
Packaging: Crates							
Packaging: Paint Cans							
Packaging: Plastic Pails							
Site-Clearing Waste							
Masonry or CMU							
Lumber: Cut-Offs							
Lumber: Warped Pieces							
Plywood or OSB (scraps)							
Wood Forms							
Wood Waste Chutes							
Wood Trim (cut-offs)							
Metals							
Insulation							
Roofing							
Joint Sealant Tubes							
Gypsum Board (scraps)							
Carpet and Pad (scraps)							
Piping							
Electrical Conduit							
Other:							

\* Insert units of measure.

FORM CWM-3: CONSTRUCTION WASTE REDUCTION WORK PLAN						
MATERIAL CATEGORY	GENERATION POINT	TOTAL EST. QUANTITY OF WASTE TONS (TONNES)	DISPOSAL METHOD AND QUANTITY			HANDLING AND TRANSPORTION PROCEDURES
			EST. AMOUNT SALVAGED TONS (TONNES)	EST. AMOUNT RECYCLED TONS (TONNES)	EST. AMOUNT DISPOSED TO LANDFILL TONS (TONNES)	
Packaging: Cardboard						
Packaging: Boxes						
Packaging: Plastic Sheet or Film						
Packaging: Polystyrene						
Packaging: Pallets or Skids						
Packaging: Crates						
Packaging: Paint Cans						
Packaging: Plastic Pails						
Site-Clearing Waste						
CMU						
Lumber: Cut-Offs						
Lumber: Warped Pieces						
Plywood or OSB (scraps)						
Wood Forms						
Wood Waste Chutes						
Wood Trim (cut-offs)						
Metals						
Insulation						
Roofing						
Joint Sealant Tubes						
Gypsum Board (scraps)						
Carpet and Pad (scraps)						
Piping						
Electrical Conduit						
Other:						

FORM CWM-5: COST/REVENUE ANALYSIS OF CONSTRUCTION WASTE REDUCTION WORK PLAN								
MATERIALS	TOTAL QUANTITY OF MATERIALS (VOL. OR WEIGHT) (A)	EST. COST OF DISPOSAL (B)	TOTAL EST. COST OF DISPOSAL (C = A x B)	REVENUE FROM SALVAGED MATERIALS (D)	REVENUE FROM RECYCLED MATERIALS (E)	LANDFILL TIPPING FEES AVOIDED (F)	HANDLING AND TRANSPORTATION COSTS AVOIDED (G)	NET COST SAVINGS OF WORK PLAN (H = D+E+F+G)
Packaging: Cardboard								
Packaging: Boxes								
Packaging: Plastic Sheet or Film								
Packaging: Polystyrene								
Packaging: Pallets or Skids								
Packaging: Crates								
Packaging: Paint Cans								
Packaging: Plastic Pails								
Site-Clearing Waste								
Masonry or CMU								
Lumber: Cut-Offs								
Lumber: Warped Pieces								
Plywood or OSB (scraps)								
Wood Forms								
Wood Waste Chutes								
Wood Trim (cut-offs)								
Metals								
Insulation								
Roofing								
Joint Sealant Tubes								
Gypsum Board (scraps)								
Carpet and Pad (scraps)								
Piping								
Electrical Conduit								
Other:								

FORM CWM-7: CONSTRUCTION WASTE REDUCTION PROGRESS REPORT								
MATERIAL CATEGORY	GENERATION POINT	TOTAL QUANTITY OF WASTE TONS (A)	QUANTITY OF WASTE SALVAGED		QUANTITY OF WASTE RECYCLED		TOTAL QUANTITY OF WASTE RECOVERED TONS (D = B + C)	TOTAL QUANTITY OF WASTE RECOVERED % (D / A x 100)
			ESTIMATED TONS	ACTUAL TONS (B)	ESTIMATED TONS	ACTUAL TONS (C)		
Packaging: Cardboard								
Packaging: Boxes								
Packaging: Plastic Sheet or Film								
Packaging: Polystyrene								
Packaging: Pallets or Skids								
Packaging: Crates								
Packaging: Paint Cans								
Packaging: Plastic Pails								
Site-Clearing Waste								
Masonry or CMU								
Lumber: Cut-Offs								
Lumber: Warped Pieces								
Plywood or OSB (scraps)								
Wood Forms								
Wood Waste Chutes								
Wood Trim (cut-offs)								
Metals								
Insulation								
Roofing								
Joint Sealant Tubes								
Gypsum Board (scraps)								
Carpet and Pad (scraps)								
Piping								
Electrical Conduit								
Other:								

## SECTION 01 7700 - CLOSEOUT PROCEDURES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
  - 1. Substantial Completion procedures.
  - 2. Final completion procedures.
  - 3. Warranties.
  - 4. Final cleaning.
  - 5. Repair of the Work.
  
- B. Related Requirements:
  - 1. Section 01 7300 "Execution" for progress cleaning of Project site.
  - 2. Section 01 7823 "Operation and Maintenance Data" for operation and maintenance manual requirements.
  - 3. Section 01 7839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
  - 4. Section 01 7900 "Demonstration and Training" for requirements for instructing Owner's personnel.

#### 1.2 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.

#### 1.3 CLOSEOUT SUBMITTALS

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

1.4 MAINTENANCE MATERIAL SUBMITTALS

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

1.5 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 Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect. Label with manufacturer's name and model number 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 Architect's signature for receipt of submittals.
5. Submit test/adjust/balance records.
6. Submit sustainable design submittals required for LEED for New Construction and Major Renovations in as specified in Section 01 8113 "Sustainable Design Requirements."
7. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

- C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Advise Owner of pending insurance changeover requirements.
2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
3. Complete startup and testing of systems and equipment.

4. Perform preventive maintenance on equipment used prior to Substantial Completion.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 01 7900 "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, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

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

## 1.6 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 Section 012900 "Payment Procedures."
2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit pest-control final inspection report.

B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

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

#### 1.7 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 and proceeding from lowest floor to highest floor.
  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 Architect.
    - d. Name of Contractor.
    - e. Page number.
  4. Submit list of incomplete items in one of the following formats:
    - a. MS Excel electronic file. Architect will return annotated file.
    - b. PDF electronic file. Architect will return annotated file.

#### 1.8 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. 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.
- C. Provide additional copies of each warranty to include in operation and maintenance manuals.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.
  - 1. Use cleaning products that comply with Green Seal's 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: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
  - 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
    - a. Clean Project site, 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; clean according to manufacturer's recommendations 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. Polish mirrors and glass, taking care not to scratch surfaces.
  - k. Remove labels that are not permanent.
  - l. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
  - m. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
  - n. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
  - o. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.
    - 1) Clean HVAC system in compliance with NADCA Standard 1992-01. Provide written report on completion of cleaning.
  - p. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
  - q. Leave Project clean and ready for occupancy.
- C. Pest Control: Comply with pest control requirements in Section 01 5000 "Temporary Facilities and Controls." Prepare written report.
- D. Construction Waste Disposal: Comply with waste disposal requirements in Section 01 7419 "Construction Waste Management and Disposal."

### 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 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 01 7700

## SECTION 01 7823 - OPERATION AND MAINTENANCE DATA

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
  - 1. Operation and maintenance documentation directory.
  - 2. Emergency manuals.
  - 3. Operation manuals for systems, subsystems, and equipment.
  - 4. Product maintenance manuals.
  - 5. Systems and equipment maintenance manuals.
- B. Related Requirements:
  - 1. Section 01 3300 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
  - 2. Section 01 9113 "General Commissioning Requirements" for verification and compilation of data into operation and maintenance manuals.

#### 1.2 DEFINITIONS

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

#### 1.3 CLOSEOUT SUBMITTALS

- A. 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. Architect and Commissioning Authority will comment on whether content of operations and maintenance submittals are acceptable.
  - 2. Where applicable, clarify and update reviewed manual content to correspond to revisions 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. One paper copy. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves.
- C. Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect and Commissioning Authority will return copy with comments.
1. Correct or revise each manual to comply with Architect's and Commissioning Authority's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's and Commissioning Authority's comments and prior to commencing demonstration and training.

## PART 2 - PRODUCTS

### 2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

- A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information. 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: Include the following information:
1. Subject matter included in manual.
  2. Name and address of Project.
  3. Name and address of Owner.
  4. Date of submittal.
  5. Name and contact information for Contractor.
  6. Name and contact information for Architect.
  7. Name and contact information for Commissioning Authority.
  8. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
  9. 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 on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

- 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 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. Use designations for systems and equipment indicated on Contract Documents.
  2. Performance and design criteria if Contractor has delegated design responsibility.
  3. Operating standards.
  4. Operating procedures.
  5. Operating logs.
  6. Wiring diagrams.
  7. Control diagrams.
  8. Piped system diagrams.
  9. Precautions against improper use.
  10. License requirements including inspection and renewal dates.
- B. Descriptions: Include the following:
1. Product name and model number. Use designations for products indicated on Contract Documents.
  2. Manufacturer's name.
  3. Equipment identification with serial number of each component.
  4. Equipment function.
  5. Operating characteristics.
  6. Limiting conditions.
  7. Performance curves.
  8. Engineering data and tests.
  9. Complete nomenclature and number of replacement parts.
- 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 and drawing or schedule designation or identifier where applicable.
- 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 and drawing or schedule designation or identifier where applicable.
- C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
  - 1. Standard 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 video recording, if available.
- E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
  - 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. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.
- B. 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.
  2. Comply with requirements of newly prepared record Drawings in Section 01 7839 "Project Record Documents."
- F. Comply with Section 01 7700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 01 7823

## SECTION 01 7839 - PROJECT RECORD DOCUMENTS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for project record documents, including the following:
1. Record Drawings.
  2. Record Specifications.
  3. Record Product Data.
  4. Miscellaneous record submittals.
- B. Related Requirements:
1. Section 01 7300 "Execution" for final property survey.
  2. Section 01 7700 "Closeout Procedures" for general closeout procedures.
  3. Section 01 7823 "Operation and Maintenance Data" for operation and maintenance manual requirements.

#### 1.2 CLOSEOUT SUBMITTALS

- A. Record Drawings: Comply with the following:
1. Number of Copies: Submit one set of marked-up record prints.
  2. Number of Copies: Submit copies of record Drawings as follows:
    - a. Submittal:
      - 1) Submit one paper-copy set of marked-up record prints.
      - 2) Submit record digital data files and three sets of record digital data file plots.
      - 3) Plot each drawing file, whether or not changes and additional information were recorded.
- B. Record Specifications: Submit annotated PDF electronic files of Project's Specifications, including addenda and contract modifications.
- C. Record Product Data: Submit annotated PDF electronic files and directories of each submittal.
1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.
- D. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit annotated PDF electronic files and directories of each submittal.

## PART 2 - PRODUCTS

### 2.1 RECORD DRAWINGS

- A. See Division of Facilities Construction and Management; General Conditions; Article 4 Contractor; 4.9 Documents and Samples at the Site, Certifying "As-Builts".
- B. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.
  1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
    - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
    - b. Accurately record information in an acceptable drawing technique.
    - c. Record data as soon as possible after obtaining it.
    - d. Record and check the markup before enclosing concealed installations.
  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 or Construction Change Directive.
    - k. Changes made following Architect's written orders.
    - l. Details not on the original Contract Drawings.
    - m. Field records for variable and concealed conditions.
    - n. Record information on the Work that is shown only schematically.
  3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
  4. Mark record 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 Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

- C. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:
1. Format: Annotated PDF electronic file with comment function enabled.
  2. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
  3. Refer instances of uncertainty to Architect for resolution.
  4. Architect will furnish Contractor one set of digital data files of the Contract Drawings for use in recording information.
    - a. See Section 01 3300 "Submittal Procedures" for requirements related to use of Architect's digital data files.
- D. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
1. Format: Annotated PDF electronic file with comment function enabled.
  2. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
  3. 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. See Division of Facilities Construction and Management; General Conditions; Article 4 Contractor; 4.9 Documents and Samples at the Site, Certifying "As-Built".
- B. 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. Note related Change Orders, record Product Data, and record Drawings where applicable.
- C. Format: Submit record Specifications as annotated PDF electronic file or scanned PDF electronic file(s) of marked-up paper copy of Specifications.

### 2.3 RECORD PRODUCT DATA

- A. See Division of Facilities Construction and Management; General Conditions; Article 4 Contractor; 4.9 Documents and Samples at the Site, Certifying “As-Builts”.
- B. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
  - 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
  - 2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
  - 3. Note related Change Orders, record Specifications, and record Drawings where applicable.
- C. Format: Submit record Product Data as annotated PDF electronic file or scanned PDF electronic file(s) of marked-up paper copy of 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 or scanned PDF electronic file(s) of marked-up miscellaneous record submittals.

## PART 3 - EXECUTION

### 3.1 RECORDING AND MAINTENANCE

- A. See Division of Facilities Construction and Management; General Conditions; Article 4 Contractor; 4.9 Documents and Samples at the Site, Certifying “As-Builts”.
- B. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.
- C. 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 Architect's reference during normal working hours.

END OF SECTION 01 7839

## SECTION 01 7900 - DEMONSTRATION AND TRAINING

### PART 1 - GENERAL

#### 1.1 SUMMARY

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

#### 1.2 INFORMATIONAL SUBMITTALS

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

#### 1.3 CLOSEOUT SUBMITTALS

- A. Demonstration and Training Video Recordings: Submit two copies within seven days of end of each training module.
  - 1. Identification: On each copy, provide an applied label with the following information:
    - a. Name of Project.
    - b. Name and address of videographer.
    - c. Name of Architect.
    - d. Name of Construction Manager.
    - e. Name of Contractor.
    - f. Date of video recording.

2. Transcript: Prepared in PDF electronic format. Include a cover sheet with same label information as the corresponding video recording and a table of contents with links to corresponding training components. Include name of Project and date of video recording on each page.
3. At completion of training, submit complete training manual for Owner's use in PDF electronic file format on compact disc.

#### 1.4 QUALITY ASSURANCE

- A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.
- B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 01 4000 "Quality Requirements," experienced in operation and maintenance procedures and training.
- C. Videographer Qualifications: A professional videographer who is experienced photographing demonstration and training events similar to those required.
- D. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Section 01 3100 "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:
  1. Inspect and discuss locations and other facilities required for instruction.
  2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
  3. Review required content of instruction.
  4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

#### 1.5 COORDINATION

- A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.
- B. Coordinate 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.
- B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:
  - 1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
    - a. System, subsystem, and equipment descriptions.
    - b. Performance and design criteria if Contractor is delegated design responsibility.
    - c. Operating standards.
    - d. Regulatory requirements.
    - e. Equipment function.
    - f. Operating characteristics.
    - g. Limiting conditions.
    - h. Performance curves.
  - 2. Documentation: Review the following items in detail:
    - a. Emergency manuals.
    - b. Operations manuals.
    - c. Maintenance manuals.
    - d. Project record documents.
    - e. Identification systems.
    - f. Warranties and bonds.
    - g. 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 training manual organized in coordination with requirements in Section 017823 "Operation and Maintenance Data."
- B. Set up instructional equipment at instruction location.

#### 3.2 INSTRUCTION

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

#### 3.3 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

- A. General: Engage a qualified commercial videographer to record demonstration and training video recordings. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.

1. At beginning of each training module, record each chart containing learning objective and lesson outline.
- B. Video: Provide minimum 640 x 480 video resolution converted to format file type acceptable to Architect, on electronic media.
1. Electronic Media: Read-only format compact disc acceptable to Owner, with commercial-grade graphic label.
  2. File Hierarchy: Organize folder structure and file locations according to project manual table of contents. Provide complete screen-based menu.
  3. File Names: Utilize file names based upon name of equipment generally described in video segment, as identified in Project specifications.
  4. Contractor and Installer Contact File: Using appropriate software, create a file for inclusion on the Equipment Demonstration and Training DVD that describes the following for each Contractor involved on the Project, arranged according to Project table of contents:
    - a. Name of Contractor/Installer.
    - b. Business address.
    - c. Business phone number.
    - d. Point of contact.
    - e. E-mail address.
- C. Narration: Describe scenes on video recording by audio narration by microphone while video recording is recorded. Include description of items being viewed.
- D. Transcript: Provide a transcript of the narration. Display images and running time captured from videotape opposite the corresponding narration segment.
- E. Preproduced Video Recordings: Provide video recordings used as a component of training modules in same format as recordings of live training.

END OF SECTION 01 7900

## SECTION 01 8113 - SUSTAINABLE DESIGN REQUIREMENTS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes general requirements and procedures for compliance with certain USGBC LEED prerequisites and credits needed for Project to obtain LEED Silver certification based on USGBC's "LEED 2009 for New Construction & Major Renovations."
1. Other LEED prerequisites and credits needed to obtain LEED certification depend on product selections and may not be specifically identified as LEED requirements. Compliance with requirements needed to obtain LEED prerequisites and credits may be used as one criterion to evaluate substitution requests and comparable product requests.
  2. Additional LEED prerequisites and credits needed to obtain the indicated LEED certification depend on Architect's design and other aspects of Project that are not part of the Work of the Contract.
  3. A copy of the LEED Project checklist is attached at the end of this Section for information only.
  4. Specific requirements for LEED are included in greater detail in other Sections.

#### 1.2 DEFINITIONS

- A. Chain-of-Custody Certificates: Certificates signed by manufacturers certifying that wood used to make products was obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship." Certificates shall include evidence that manufacturer is certified for chain of custody by an FSC-accredited certification body.
- B. Regional Materials: Materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site. If only a fraction of a product or material is extracted/harvested/recovered and manufactured locally, then only that percentage (by weight) shall contribute to the regional value.
- C. Recycled Content: The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.
1. "Post-consumer" material is defined as waste material generated by households or by commercial, industrial, and institutional facilities in their role as end users of the product, which can no longer be used for its intended purpose.
  2. "Pre-consumer" material is defined as material diverted from the waste stream during the manufacturing process. Excluded is reutilization of materials such as rework, regrind, or scrap generated in a process and capable of being reclaimed within the same process that generated it.

### 1.3 ADMINISTRATIVE REQUIREMENTS

- A. Respond to questions and requests from Architect and the USGBC regarding LEED credits that are the responsibility of the Contractor, that depend on product selection or product qualities, or that depend on Contractor's procedures until the USGBC has made its determination on the project's LEED certification application. Document responses as informational submittals.

### 1.4 ACTION SUBMITTALS

- A. General: Submit additional LEED submittals required by other Specification Sections.
- B. LEED submittals are in addition to other submittals. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance with indicated LEED requirements.
- C. LEED Documentation Submittals:
  - 1. Credit MR 2: Comply with Section 017419 "Construction Waste Management and Disposal."
  - 2. Credit MR 4: Product data and certification letter from product manufacturers indicating percentages by weight of post-consumer and pre-consumer recycled content for products having recycled content. Include statement indicating material cost for each product having recycled content.
  - 3. Credit MR 5: Product data for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.
  - 4. Credit MR 7: Product data and chain-of-custody certificates for products containing certified wood. Include statement indicating cost for each certified wood product.
  - 5. Credit IEQ 3.1:
    - a. Construction indoor-air-quality management plan.
    - b. Product data for temporary filtration media.
    - c. Product data for filtration media used during occupancy.
    - d. Construction Documentation: Six photographs at three different times during the construction period, along with a brief description of the SMACNA approach employed, documenting implementation of the indoor-air-quality management measures, such as protection of ducts and on-site stored or installed absorptive materials.
  - 6. Credit IEQ 3.2:
    - a. Signed statement describing the building air flush-out procedures including the dates when flush-out was begun and completed and statement that filtration media was replaced after flush-out.
    - b. Product data for filtration media used during flush-out and during occupancy.

7. Credit IEQ 4.1: Product data for adhesives and sealants used inside the weatherproofing system indicating VOC content of each product used.
8. Credit IEQ 4.2: Product data for paints and coatings used inside the weatherproofing system indicating VOC content of each product used.
9. Credit IEQ 4.4: Product data for products containing composite wood or agrifiber products or wood glues indicating that they do not contain urea-formaldehyde resin.

## 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For LEED coordinator.
- B. Project Materials Cost Data: Provide statement indicating total cost for materials used for Project. Costs exclude labor, overhead, and profit. Include breakout of costs for the following categories of items:
  1. Plumbing.
  2. Mechanical.
  3. Electrical.
  4. Specialty items such as elevators and equipment.
  5. Wood-based construction materials.
- C. LEED Action Plans: Provide preliminary submittals within 14 days of date established for commencement of the Work indicating how the following requirements will be met:
  1. Credit MR 2: Waste management plan complying with Section 017419 "Construction Waste Management and Disposal."
  2. Credit MR 4: List of proposed materials with recycled content. Indicate cost, post-consumer recycled content, and pre-consumer recycled content for each product having recycled content.
  3. Credit MR 5: List of proposed regional materials. Identify each regional material, including its source, cost, and the fraction by weight that is considered regional.
  4. Credit MR 7: List of proposed certified wood products. Indicate each product containing certified wood, including its source and cost of certified wood products.
  5. Credit IEQ 3.1: Construction indoor-air-quality management plan.
- D. LEED Progress Reports: Concurrent with each Application for Payment, submit reports comparing actual construction and purchasing activities with LEED action plans for the following:
  1. Credit MR 2: Waste reduction progress reports complying with Section 01 7419 "Construction Waste Management and Disposal."
  2. Credit MR 4: Recycled content.
  3. Credit MR 5: Regional materials.
  4. Credit MR 7: Certified wood products.

1.6 QUALITY ASSURANCE

- A. LEED Coordinator: Engage an experienced LEED-Accredited Professional to coordinate LEED requirements. LEED coordinator may also serve as waste management coordinator.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Provide products and procedures necessary to obtain LEED credits required in this Section. Although other Sections may specify some requirements that contribute to LEED credits, the Contractor shall determine additional materials and procedures necessary to obtain LEED credits indicated.

2.2 RECYCLED CONTENT OF MATERIALS

- A. Credit MR 4: Building materials shall have recycled content such that post-consumer recycled content plus one-half of pre-consumer recycled content for Project constitutes a minimum of [10] [20] percent of cost of materials used for Project.
1. Cost of post-consumer recycled content plus one-half of pre-consumer recycled content of an item shall be determined by dividing weight of post-consumer recycled content plus one-half of pre-consumer recycled content in the item by total weight of the item and multiplying by cost of the item.
  2. Do not include plumbing, mechanical and electrical components, and specialty items such as elevators and equipment in the calculation.

2.3 REGIONAL MATERIALS

- A. Credit MR 5: Not less than 20 percent of building materials (by cost) shall be regional materials.

2.4 CERTIFIED WOOD

- A. Credit MR 7: Not less than 50 percent (by cost) of wood-based materials shall be produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."
1. Wood-based materials include, but are not limited to, the following materials when made from wood, engineered wood products, or wood-based panel products:
    - a. Miscellaneous carpentry.
    - b. Heavy timber construction.
    - c. Architectural woodwork.

- d. Wood cabinets.

## 2.5 LOW-EMITTING MATERIALS

- A. Credit IEQ 4.1: For field applications that are inside the weatherproofing system, adhesives and sealants shall comply with the following VOC content limits when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Wood Glues: 30 g/L.
2. Metal-to-Metal Adhesives: 30 g/L.
3. Adhesives for Porous Materials (Except Wood): 50 g/L.
4. Subfloor Adhesives: 50 g/L.
5. Plastic Foam Adhesives: 50 g/L.
6. Carpet Adhesives: 50 g/L.
7. VCT and Asphalt Tile Adhesives: 50 g/L.
8. Cove Base Adhesives: 50 g/L.
9. Gypsum Board and Panel Adhesives: 50 g/L.
10. Rubber Floor Adhesives: 60 g/L.
11. Ceramic Tile Adhesives: 65 g/L.
12. Multipurpose Construction Adhesives: 70 g/L.
13. Fiberglass Adhesives: 80 g/L.
14. Contact Adhesive: 80 g/L.
15. Structural Glazing Adhesives: 100 g/L.
16. Structural Wood Member Adhesive: 140 g/L.
17. Single-Ply Roof Membrane Adhesive: 250 g/L.
18. Special-Purpose Contact Adhesive (contact adhesive that is used to bond melamine-covered board, metal, unsupported vinyl, rubber, or wood veneer 1/16 inch or less in thickness to any surface): 250 g/L.
19. Top and Trim Adhesive: 250 g/L.
20. Plastic Cement Welding Compounds: 250 g/L.
21. ABS Welding Compounds: 325 g/L.
22. CPVC Welding Compounds: 490 g/L.
23. PVC Welding Compounds: 510 g/L.
24. Adhesive Primer for Plastic: 550 g/L.
25. Sheet-Applied Rubber Lining Adhesive: 850 g/L.
26. Aerosol Adhesive, General-Purpose Mist Spray: 65 percent by weight.
27. Aerosol Adhesive, General-Purpose Web Spray: 55 percent by weight.
28. Special-Purpose Aerosol Adhesive (All Types): 70 percent by weight.
29. Other Adhesives: 250 g/L.
30. Architectural Sealants: 250 g/L.
31. Nonmembrane Roof Sealants: 300 g/L.
32. Single-Ply Roof Membrane Sealants: 450 g/L.
33. Other Sealants: 420 g/L.
34. Sealant Primers for Nonporous Substrates: 250 g/L.
35. Sealant Primers for Porous Substrates: 775 g/L.
36. Modified Bituminous Sealant Primers: 500 g/L.
37. Other Sealant Primers: 750 g/L.

- B. Credit IEQ 4.2: For field applications that are inside the weatherproofing system, paints and coatings shall comply with the following VOC content limits when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
1. Flat Paints and Coatings: VOC not more than 50 g/L.
  2. Nonflat Paints and Coatings: VOC not more than 150 g/L.
  3. Primers, Sealers, and Undercoaters: VOC not more than 200 g/L.
  4. Anticorrosive and Antirust Paints Applied to Ferrous Metals: VOC not more than 250 g/L.
  5. Zinc-Rich Industrial Maintenance Primers: VOC not more than 340 g/L.
  6. Pretreatment Wash Primers: VOC not more than 420 g/L.
  7. Clear Wood Finishes, Varnishes: VOC not more than 350 g/L.
  8. Clear Wood Finishes, Lacquers: VOC not more than 550 g/L.
  9. Floor Coatings: VOC not more than 100 g/L.
  10. Stains: VOC not more than 250 g/L.
- C. Credit IEQ 4.4: Composite wood, agrifiber products, and adhesives shall not contain urea-formaldehyde resin.

### PART 3 - EXECUTION

#### 3.1 MEASUREMENT AND VERIFICATION

- A. If not already in place, install metering equipment to measure energy usage. Monitor, record, and trend log measurements.
- B. Evaluate energy performance and efficiency by comparing actual to predicted performance.
- C. Measurement and verification period shall cover at least one year of postconstruction occupancy.

#### 3.2 CONSTRUCTION WASTE MANAGEMENT

- A. Credit MR 2: Comply with Section 01 7419 "Construction Waste Management and Disposal."

#### 3.3 CONSTRUCTION INDOOR-AIR-QUALITY MANAGEMENT

- A. Credit IEQ 3.1: Comply with SMACNA's "SMACNA IAQ Guideline for Occupied Buildings under Construction."
  1. If Owner authorizes use of permanent heating, cooling, and ventilating systems during construction period as specified in Section 01 5000 "Temporary Facilities and Controls," install filter media having a MERV 8 according to ASHRAE 52.2 at each return-air inlet for the air-handling system used during construction.
  2. Replace all air filters immediately prior to occupancy.

B. Credit IEQ 3.2: Comply with one of the following requirements:

1. After construction ends, prior to occupancy and with all interior finishes installed, perform a building flush-out by supplying a total volume of 14000 cu. ft. of outdoor air per sq. ft. of floor area while maintaining an internal temperature of at least 60 deg F and a relative humidity no higher than 60 percent.
2. If occupancy is desired prior to flush-out completion, the space may be occupied following delivery of a minimum of 3500 cu. ft. of outdoor air per sq. ft. of floor area to the space. Once a space is occupied, it shall be ventilated at a minimum rate of 0.30 cfm per sq. ft. of outside air or the design minimum outside air rate determined in Prerequisite IEQ 1, whichever is greater. During each day of the flush-out period, ventilation shall begin a minimum of three hours prior to occupancy and continue during occupancy. These conditions shall be maintained until a total of 14000 cu. ft./sq. ft. of outside air has been delivered to the space.
3. Air-Quality Testing:
  - a. Conduct baseline indoor-air-quality testing, after construction ends and prior to occupancy, using testing protocols consistent with the EPA's "Compendium of Methods for the Determination of Air Pollutants in Indoor Air," and as additionally detailed in the USGBC's "Green Building Design and Construction Reference Guide."
  - b. Demonstrate that the contaminant maximum concentrations listed below are not exceeded:
    - 1) Formaldehyde: 27 ppb.
    - 2) Particulates (PM10): 50 micrograms/cu. m.
    - 3) Total Volatile Organic Compounds (TVOC): 500 micrograms/cu. m.
    - 4) 4-Phenylcyclohexene (4-PH): 6.5 micrograms/cu. m.
    - 5) Carbon Monoxide: 9 ppm and no greater than 2 ppm above outdoor levels.
  - c. For each sampling point where the maximum concentration limits are exceeded, conduct additional flush-out with outside air and retest the specific parameter(s) exceeded to indicate the requirements are achieved. Repeat procedure until all requirements have been met. When retesting noncomplying building areas, take samples from same locations as in the first test.
  - d. Air-sample testing shall be conducted as follows:
    - 1) All measurements shall be conducted prior to occupancy but during normal occupied hours, and with building ventilation system starting at the normal daily start time and operated at the minimum outside air flow rate for the occupied mode throughout the duration of the air testing.
    - 2) Building shall have all interior finishes installed including, but not limited to, millwork, doors, paint, carpet, and acoustic tiles. Nonfixed furnishings such as workstations and partitions are encouraged, but not required, to be in place for the testing.
    - 3) Number of sampling locations varies depending on the size of building and number of ventilation systems. For each portion of building served by a separate ventilation system, the number of sampling points shall not be less than one per 25,000 sq. ft. or for each contiguous floor area, whichever is

- larger, and shall include areas with the least ventilation and greatest presumed source strength.
- 4) Air samples shall be collected between 3 and 6 feet from the floor to represent the breathing zone of occupants, and over a minimum four-hour period.

END OF SECTION 01 8113

FFKR Project Green Checklist and LEED Expectations



Project: Mark I. Payne Bldg. - Utah State Hospital  
 Date: 03/30/12  
 Phase: Design Development  
 Worksheet Based on LEED 2009-NC

Sustainable Sites	Points Available	YES	POTENTIAL	NO	Notes
SS Prerequisite 1: Construction Activity Pollution Prevention	Required	Yes			
SS Credit 1: Site Selection	1	1			
SS Credit 2: Development Density & Community Connectivity	5	5			
SS Credit 3: Brownfield Redevelopment	1			1	N/A
SS Credit 4.1: Alternative Transportation: Public Transportation Access	6	6			Seeking alternative compliance path
SS Credit 4.2: Alternative Transportation: Bicycle Storage & Changing Rooms	1	1			
SS Credit 4.3: Alternative Transportation: Low Emitting & Fuel Efficient Vehicles	3	3			
SS Credit 4.4: Alternative Transportation: Parking Capacity	2	2			
SS Credit 5.1: Site Development: Protect or Restore Habitat	1		1		RP; ArcSifto to evaluate
SS Credit 5.2: Site Development: Maximize Open Space	1		1		ArcSifto to evaluate
SS Credit 6.1: Stormwater Design: Quantity Control	1	1			Required by the DFCM
SS Credit 6.2: Stormwater Design: Quality Control	1	1			RP
SS Credit 7.1: Heat Island Effect: Non-Roof	1			1	Difficult with asphalt parking
SS Credit 7.2: Heat Island Effect: Roof	1	1			
SS Credit 8: Light Pollution Reduction	1		1		
<b>Total Sustainable Sites Points</b>	<b>26</b>	<b>21</b>	<b>3</b>	<b>2</b>	

Water Efficiency	Points Available	YES	POTENTIAL	NO	Notes
WE Prerequisite 1: Water Use Reduction	Required	Yes			
WE Credit 1.1: Water Efficient Landscaping: Reduce by 50%	2	2			Required by the DFCM
WE Credit 1.1: Water Efficient Landscaping: No Potable Water Use or No Irrigation	2	2			Tap into irrigation line on site
WE Credit 2: Innovative Wastewater Technologies	2			2	No (Budget)
WE Credit 3.1: Water Use Reduction: 30% Reduction	2	2			Yes
WE Credit 3.2: Water Use Reduction: 35% Reduction	1		1		Stretch
WE Credit 3.3: Water Use Reduction: 40% Reduction	1			1	Not Likely
<b>Total Water Efficiency Points</b>	<b>10</b>	<b>6</b>	<b>1</b>	<b>3</b>	

Energy & Atmosphere	Points Available	YES	POTENTIAL	NO	Notes
EA Prerequisite 1: Fundamental Commissioning of the Building Energy Systems	Required	Yes			DFCM to hire CX Agent
EA Prerequisite 2: Minimum Energy Performance	Required	Yes			
EA Prerequisite 3: Fundamental Refrigerant Management	Required	Yes			
EA Credit 1: Optimize Energy Performance	19	5	4	10	RP; Placeholder - This is a wild card
EA Credit 2: On-Site Renewable Energy	7			7	RP; No (Budget)
EA Credit 3: Enhanced Commissioning	2	2			Required by the DFCM; DFCM to hire CX Agent
EA Credit 4: Enhanced Refrigerant Management	2	2			
EA Credit 5: Measurement & Verification	3			3	No (Budget)
EA Credit 6: Green Power	2		2		Back Pocket
<b>Total Energy &amp; Atmosphere Points</b>	<b>35</b>	<b>9</b>	<b>6</b>	<b>20</b>	

Materials & Resources	Points Available	YES	POTENTIAL	NO	Notes
MR Prerequisite 1: Storage & Collection of Recyclables	Required	Yes			Patient Collection
MR Credit 1.1: Building Reuse: Maintain 55% of Existing Walls, Floors & Roof	1			1	N/A
MR Credit 1.1: Building Reuse - Maintain 75% of Existing Walls, Floors & Roof	1			1	N/A
MR Credit 1.1: Building Reuse - Maintain 95% of Existing Walls, Floors & Roof	1			1	N/A
MR Credit 1.2: Building Reuse: Maintain 50% of Interior Non-Structural Elements	1			1	N/A
MR Credit 2.1: Construction Waste Management: Divert 50% From Disposal	1	1			RP
MR Credit 2.2: Construction Waste Management: Divert 75% From Disposal	1	1			
MR Credit 3.1: Materials Reuse: 5%	1			1	Not Seeking
MR Credit 3.2: Materials Reuse: 10%	1			1	Not Seeking
MR Credit 4.1: Recycled Content: 10% (post-consumer + 1/2 pre-consumer)	1	1			
MR Credit 4.2: Recycled Content: 20% (post-consumer + 1/2 pre-consumer)	1		1		
MR Credit 5.1: Regional Materials: 10% Extracted, Processed & Manufactured Regionally	1	1			
MR Credit 5.2: Regional Materials: 20% Extracted, Processed & Manufactured Regionally	1		1		
MR Credit 6: Rapidly Renewable Materials	1			1	Not Seeking
MR Credit 7: Certified Wood	1	1			
<b>Total Materials &amp; Resources Points</b>	<b>14</b>	<b>5</b>	<b>2</b>	<b>7</b>	

Indoor Environmental Quality	Points Available	YES	POTENTIAL	NO	Notes
EQ Prerequisite 1: Minimum IAQ Performance	Required	Yes			
EQ Prerequisite 2: Environmental Tobacco Smoke (ETS) Control	Required	Yes			
EQ Credit 1: Outdoor Air Delivery Monitoring	1	1			
EQ Credit 2: Increased Ventilation	1		1		
EQ Credit 3.1: Construction IAQ Management Plan: During Construction	1	1			Required by the DFCM
EQ Credit 3.2: Construction IAQ Management Plan: Before Occupancy	1	1			
EQ Credit 4.1: Low-Emitting Materials: Adhesives & Sealants	1	1			Required by the DFCM
EQ Credit 4.2: Low-Emitting Materials: Paints & Coatings	1	1			Required by the DFCM
EQ Credit 4.3: Low-Emitting Materials: Carpet Systems	1	1			
EQ Credit 4.4: Low-Emitting Materials: Composite Wood & Agrifiber Products	1	1			
EQ Credit 5: Indoor Chemical & Pollutant Source Control	1	1			
EQ Credit 6.1: Controllability of Systems: Lighting	1	1			
EQ Credit 6.2: Controllability of Systems: Thermal Comfort	1		1		
EQ Credit 7.1: Thermal Comfort: Design	1	1			
EQ Credit 7.2: Thermal Comfort: Verification	1	1			
EQ Credit 8.1: Daylight & Views: Daylight 75% of Spaces	1			1	RP; Very difficult in healthcare projects
EQ Credit 8.2: Daylight & Views: Views for 90% of Spaces	1	1			
<b>Total Indoor Environmental Quality Points</b>	<b>15</b>	<b>12</b>	<b>2</b>	<b>1</b>	

Innovation & Design	Points Available	YES	POTENTIAL	NO	Notes
ID Credit 1.1: Exemplary Performance	1	1			
ID Credit 1.2: Exemplary Performance	1	1			
ID Credit 1.3: Exemplary Performance	1	1			
ID Credit 1.4: Innovation in Design	1	1			
ID Credit 1.5: Innovation in Design	1	1			
ID Credit 2: LEED Accredited Professional	1	1			
<b>Total Innovation &amp; Design Points</b>	<b>6</b>	<b>6</b>	<b>0</b>	<b>0</b>	

Regional Priority	Points Available	YES	POTENTIAL	NO	Notes
RP Credit 1: Regional Priority   EAc1 36% New / 32% Existing	1			1	
RP Credit 1: Regional Priority   EAc2 5% Renewable Energy	1			1	
RP Credit 1: Regional Priority   IEQc8.1	1			1	
RP Credit 1: Regional Priority   MRc2 Recycle/Salvaged: 50%	1	1			
RP Credit 1: Regional Priority   SSc5.1	1		1		
RP Credit 1: Regional Priority   SSc6.2	1	1			
<b>Total Innovation &amp; Design Points</b>	<b>6</b>	<b>2</b>	<b>1</b>	<b>3</b>	

Summary	Points Available	YES	POTENTIAL	NO
<b>Section Totals</b>	<b>112</b>	<b>61</b>	<b>15</b>	<b>36</b>

LEED 2009 Ratings  
 Certified 40-49 Points  
 Silver 50-59 Points  
 Gold 60-79 Points  
 Platinum 80+ Points

FFKR Project Green Checklist and LEED Expectations



Project: Pediatric Facility - Utah State Hospital  
 Date: 03/30/12  
 Phase: Design Development  
 Worksheet Based on LEED 2009-NC

Sustainable Sites	Points Available	YES	POTENTIAL	NO	Notes
SS Prerequisite 1: Construction Activity Pollution Prevention	Required	Yes			
SS Credit 1: Site Selection	1	1			
SS Credit 2: Development Density & Community Connectivity	5	5			
SS Credit 3: Brownfield Redevelopment	1			1	N/A
SS Credit 4.1: Alternative Transportation: Public Transportation Access	6	6			Seeking alternative compliance path
SS Credit 4.2: Alternative Transportation: Bicycle Storage & Changing Rooms	1	1			
SS Credit 4.3: Alternative Transportation: Low Emitting & Fuel Efficient Vehicles	3	3			
SS Credit 4.4: Alternative Transportation: Parking Capacity	2	2			
SS Credit 5.1: Site Development: Protect or Restore Habitat	1		1		RP; ArcSizio to evaluate
SS Credit 5.2: Site Development: Maximize Open Space	1		1		ArcSizio to evaluate
SS Credit 6.1: Stormwater Design: Quantity Control	1	1			Required by the DFCM
SS Credit 6.2: Stormwater Design: Quality Control	1	1			RP
SS Credit 7.1: Heat Island Effect: Non-Roof	1			1	Difficult with asphalt parking
SS Credit 7.2: Heat Island Effect: Roof	1	1			
SS Credit 8: Light Pollution Reduction	1		1		
<b>Total Sustainable Sites Points</b>	<b>26</b>	<b>21</b>	<b>3</b>	<b>2</b>	

Water Efficiency	Points Available	YES	POTENTIAL	NO	Notes
WE Prerequisite 1: Water Use Reduction	Required	Yes			
WE Credit 1.1: Water Efficient Landscaping: Reduce by 50%	2	2			Required by the DFCM
WE Credit 1.1: Water Efficient Landscaping: No Potable Water Use or No Irrigation	2	2			Tap into irrigation line on site
WE Credit 2: Innovative Wastewater Technologies	2			2	No (Budget)
WE Credit 3.1: Water Use Reduction: 30% Reduction	2	2			Yes
WE Credit 3.2: Water Use Reduction: 35% Reduction	1		1		Stretch
WE Credit 3.3: Water Use Reduction: 40% Reduction	1			1	Not Likely
<b>Total Water Efficiency Points</b>	<b>10</b>	<b>6</b>	<b>1</b>	<b>3</b>	

Energy & Atmosphere	Points Available	YES	POTENTIAL	NO	Notes
EA Prerequisite 1: Fundamental Commissioning of the Building Energy Systems	Required	Yes			DFCM to hire CX Agent
EA Prerequisite 2: Minimum Energy Performance	Required	Yes			
EA Prerequisite 3: Fundamental Refrigerant Management	Required	Yes			
EA Credit 1: Optimize Energy Performance	19	5	4	10	RP; Placeholder - This is a wild card
EA Credit 2: On-Site Renewable Energy	7			7	RP; No (Budget)
EA Credit 3: Enhanced Commissioning	2	2			Required by the DFCM; DFCM to hire CX Agent
EA Credit 4: Enhanced Refrigerant Management	2	2			
EA Credit 5: Measurement & Verification	3			3	No (Budget)
EA Credit 6: Green Power	2		2		Back Pocket
<b>Total Energy &amp; Atmosphere Points</b>	<b>35</b>	<b>9</b>	<b>6</b>	<b>20</b>	

Materials & Resources	Points Available	YES	POTENTIAL	NO	Notes
MR Prerequisite 1: Storage & Collection of Recyclables	Required	Yes			Patient Collection
MR Credit 1.1: Building Reuse: Maintain 55% of Existing Walls, Floors & Roof	1			1	N/A
MR Credit 1.1: Building Reuse - Maintain 75% of Existing Walls, Floors & Roof	1			1	N/A
MR Credit 1.1: Building Reuse - Maintain 95% of Existing Walls, Floors & Roof	1			1	N/A
MR Credit 1.2: Building Reuse: Maintain 50% of Interior Non-Structural Elements	1			1	N/A
MR Credit 2.1: Construction Waste Management: Divert 50% From Disposal	1	1			RP
MR Credit 2.2: Construction Waste Management: Divert 75% From Disposal	1	1			
MR Credit 3.1: Materials Reuse: 5%	1			1	Not Seeking
MR Credit 3.2: Materials Reuse: 10%	1			1	Not Seeking
MR Credit 4.1: Recycled Content: 10% (post-consumer + 1/2 pre-consumer)	1	1			
MR Credit 4.2: Recycled Content: 20% (post-consumer + 1/2 pre-consumer)	1		1		
MR Credit 5.1: Regional Materials: 10% Extracted, Processed & Manufactured Regionally	1	1			
MR Credit 5.2: Regional Materials: 20% Extracted, Processed & Manufactured Regionally	1		1		
MR Credit 6: Rapidly Renewable Materials	1			1	Not Seeking
MR Credit 7: Certified Wood	1	1			
<b>Total Materials &amp; Resources Points</b>	<b>14</b>	<b>5</b>	<b>2</b>	<b>7</b>	

Indoor Environmental Quality	Points Available	YES	POTENTIAL	NO	Notes
EQ Prerequisite 1: Minimum IAQ Performance	Required	Yes			
EQ Prerequisite 2: Environmental Tobacco Smoke (ETS) Control	Required	Yes			
EQ Credit 1: Outdoor Air Delivery Monitoring	1	1			
EQ Credit 2: Increased Ventilation	1		1		
EQ Credit 3.1: Construction IAQ Management Plan: During Construction	1	1			Required by the DFCM
EQ Credit 3.2: Construction IAQ Management Plan: Before Occupancy	1	1			
EQ Credit 4.1: Low-Emitting Materials: Adhesives & Sealants	1	1			Required by the DFCM
EQ Credit 4.2: Low-Emitting Materials: Paints & Coatings	1	1			Required by the DFCM
EQ Credit 4.3: Low-Emitting Materials: Carpet Systems	1	1			
EQ Credit 4.4: Low-Emitting Materials: Composite Wood & Agrifiber Products	1	1			
EQ Credit 5: Indoor Chemical & Pollutant Source Control	1	1			
EQ Credit 6.1: Controllability of Systems: Lighting	1	1			
EQ Credit 6.2: Controllability of Systems: Thermal Comfort	1		1		
EQ Credit 7.1: Thermal Comfort: Design	1	1			
EQ Credit 7.2: Thermal Comfort: Verification	1	1			
EQ Credit 8.1: Daylight & Views: Daylight 75% of Spaces	1			1	RP; Very difficult in healthcare projects
EQ Credit 8.2: Daylight & Views: Views for 90% of Spaces	1	1			
<b>Total Indoor Environmental Quality Points</b>	<b>15</b>	<b>12</b>	<b>2</b>	<b>1</b>	

Innovation & Design	Points Available	YES	POTENTIAL	NO	Notes
ID Credit 1.1: Exemplary Performance	1	1			
ID Credit 1.2: Exemplary Performance	1	1			
ID Credit 1.3: Exemplary Performance	1	1			
ID Credit 1.4: Innovation in Design	1	1			
ID Credit 1.5: Innovation in Design	1	1			
ID Credit 2: LEED Accredited Professional	1	1			
<b>Total Innovation &amp; Design Points</b>	<b>6</b>	<b>6</b>	<b>0</b>	<b>0</b>	

Regional Priority	Points Available	YES	POTENTIAL	NO	Notes
RP Credit 1: Regional Priority   EAc1 36% New / 32% Existing	1			1	
RP Credit 1: Regional Priority   EAc2 5% Renewable Energy	1			1	
RP Credit 1: Regional Priority   IEQc8.1	1			1	
RP Credit 1: Regional Priority   MRc2 Recycle/Salvaged: 50%	1	1			
RP Credit 1: Regional Priority   SSc5.1	1		1		
RP Credit 1: Regional Priority   SSc6.2	1	1			
<b>Total Innovation &amp; Design Points</b>	<b>6</b>	<b>2</b>	<b>1</b>	<b>3</b>	

Summary	Points Available	YES	POTENTIAL	NO	Notes
<b>Section Totals</b>	<b>112</b>	<b>61</b>	<b>15</b>	<b>36</b>	

LEED 2009 Ratings  
 Certified 40-49 Points  
 Silver 50-59 Points  
 Gold 60-79 Points  
 Platinum 80+ Points

## SECTION 01 9113 - GENERAL COMMISSIONING REQUIREMENTS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. OPR and BoD documentation are included by reference for information only.

#### 1.2 SUMMARY

- A. Section includes general requirements that apply to implementation of commissioning without regard to specific systems, assemblies, or components.
- B. Related Sections:
  - 1. Section 23 0800 "Commissioning of HVAC" for commissioning process activities for HVAC&R systems, assemblies, equipment, and components.

#### 1.3 DEFINITIONS

- A. BoD: Basis of Design. A document that records concepts, calculations, decisions, and product selections used to meet the OPR and to satisfy applicable regulatory requirements, standards, and guidelines. The document includes both narrative descriptions and lists of individual items that support the design process.
- B. Commissioning Plan: A document that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process.
- C. CxA: Commissioning Authority.
- D. OPR: Owner's Project Requirements. A document that details the functional requirements of a project and the expectations of how it will be used and operated. These include Project goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information.
- E. Systems, Subsystems, Equipment, and Components: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, equipment, and components.

#### 1.4 COMMISSIONING TEAM

- A. Members Appointed by Contractors: Individuals, each having the authority to act on behalf of the entity he or she represents, explicitly organized to implement the commissioning process through coordinated action. The commissioning team shall consist of, but not be limited to,

representatives of Contractor, including Project superintendent and subcontractors, installers, suppliers, and specialists deemed appropriate by the CxA.

B. Members Appointed by Owner:

1. CxA: The designated person, company, or entity that plans, schedules, and coordinates the commissioning team to implement the commissioning process. Owner will engage the CxA under a separate contract.
2. Representatives of the facility user and operation and maintenance personnel.
3. Architect and engineering design professionals.

1.5 OWNER'S RESPONSIBILITIES

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

1.6 CONTRACTOR'S RESPONSIBILITIES

- A. Contractor shall assign representatives with expertise and authority to act on its behalf and shall schedule them to participate in and perform commissioning process activities including, but not limited to, the following:
  1. Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.
  2. Cooperate with the CxA for resolution of issues recorded in the Issues Log.
  3. Attend commissioning team meetings held on a weekly basis.
  4. Integrate and coordinate commissioning process activities with construction schedule.
  5. Review and accept construction checklists provided by the CxA.
  6. Complete electronic construction checklists as Work is completed and provide to the Commissioning Authority on a weekly basis.
  7. Review and accept commissioning process test procedures provided by the Commissioning Authority.
  8. Complete commissioning process test procedures.

1.7 CxA'S RESPONSIBILITIES

- A. Organize and lead the commissioning team.
- B. Provide commissioning plan.

- C. Convene commissioning team meetings.
- D. Provide Project-specific construction checklists and commissioning process test procedures.
- E. Verify the execution of commissioning process activities using random sampling. The sampling rate may vary from 1 to 100 percent. Verification will include, but is not limited to, equipment submittals, construction checklists, training, operating and maintenance data, tests, and test reports to verify compliance with the OPR. When a random sample does not meet the requirement, the CxA will report the failure in the Issues Log.
- F. Prepare and maintain the Issues Log.
- G. Prepare and maintain completed construction checklist log.
- H. Witness systems, assemblies, equipment, and component startup.
- I. Compile test data, inspection reports, and certificates; include them in the systems manual and commissioning process report.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 9113

## SECTION 03 3000 - CAST-IN-PLACE CONCRETE

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
  - 1. Footings.
  - 2. Foundation walls.
  - 3. Slabs-on-grade.
  - 4. Suspended slabs.
  
- B. Related Sections:
  - 1. Section 03 3300 "Architectural Concrete" for general building applications of specially finished formed concrete.
  - 2. Section 09 9123 "Interior Painting" for stains at indicated concrete slabs at Pediatric building.
  - 3. Section 31 2000 "Earth Moving" for drainage fill under slabs-on-grade.
  - 4. Section 32 1313 "Concrete Paving" for concrete pavement and walks.

#### 1.2 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans; subject to compliance with requirements.
  
- B. Drying Shrinkage Limit: Percentage change in length after 28 days of drying when tested per ASTM C157 with 4 inch x 4 inch x 11 inch specimen moist cured 7 days prior to drying.
  
- C. High Quality Architectural Concrete: All exposed-to-view concrete, such as tops of foundations walls, and all concrete surfaces to receive waterproofing.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
  
- B. LEED Submittals:
  - 1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

2. Design Mixtures for Credit ID 1.1: For each concrete mixture containing fly ash as a replacement for portland cement or other portland cement replacements, and for equivalent concrete mixtures that do not contain portland cement replacements.
  - C. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
    1. Indicate amounts of mixing water to be withheld for later addition at Project site.
    2. Include 28-day mix design compressive strength histories as per ACI 318.
    3. Include drying shrinkage limit test results for interior slabs on grade mix design.
  - D. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement. Include details of polished finish floors.
  - E. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly, and support of formwork.
    1. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and reshoring installation and removal.
    2. For exposed high quality architectural concrete, obtain Architect's written approval of all formwork markings on shop drawings and mockups
  - F. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
    1. Location of construction joints is subject to approval of the Architect.
  - G. Samples: For waterstops and vapor retarder.
- 1.4 INFORMATIONAL SUBMITTALS
- A. Qualification Data: For Installer.
  - B. Material Certificates: For each of the following, signed by manufacturers:
    1. Cementitious materials.
    2. Admixtures.
    3. Form materials and form-release agents.
    4. Steel reinforcement and accessories.
    5. Fiber reinforcement.
    6. Waterstops.
    7. Curing compounds.
    8. Floor and slab treatments.
    9. Bonding agents.
    10. Adhesives.

11. Vapor retarders.
12. Joint-filler strips.
13. Repair materials.

C. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:

1. Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.

D. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.

E. Polished floor installation procedures.

F. Field quality-control reports.

G. Minutes of preinstallation conference.

#### 1.5 QUALITY ASSURANCE

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

1. For polished floors Work, use certified and qualified installer and adequate number of skilled workmen who are trained and experienced in polished finishing of concrete slabs.

B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

C. High Quality Architectural Concrete: Provide consistent appearance for exposed-to-view concrete. Provide exposed concrete that has no less than the following characteristics:

1. Proper and consistent alignment of form panels and form ties.
2. Absence of staining from form leakage.
3. Absence of honeycomb or excessive segregation due to improper vibration or form leakage.
4. Correct placement of rustication or other detail treatment as shown on drawings.
5. Truly square and plumb corners unless clearly directed otherwise.
6. Absence of markings from formwork (i.e. use MDF or plastic forms).

D. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
  2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.
- E. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.
- F. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D 1.4M, "Structural Welding Code - Reinforcing Steel."
- G. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
1. ACI 301, "Specifications for Structural Concrete," Sections 1 through 5.
  2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
- H. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.
- I. Mockups: Cast concrete formed-surface panels to demonstrate typical joints, surface finish, texture, tolerances, floor treatments, and standard of workmanship.
1. Build panel approximately 200 sq. ft. for slab-on-grade and 100 sq. ft. for formed surface in the location indicated or, if not indicated, as directed by Architect. Include portion of polished floor in mockup slab area.
  2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- J. Preinstallation Conference: Conduct conference at Project site.
1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
    - a. Contractor's superintendent.
    - b. Independent testing agency responsible for concrete design mixtures.
    - c. Ready-mix concrete manufacturer.
    - d. Concrete subcontractor.
    - e. Special concrete finish subcontractor.
  2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, forms and form removal limitations, shoring and reshoring procedures, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement

installation, floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.
- B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

#### 1.7 GUARANTEE

- A. Special Guarantee: On form approved by Architect, without monetary limitation, in which manufacturer agrees to promptly repair or replace all components of concrete that fails in materials or workmanship, including material and labor, within specified guarantee period.
  - 1. Failures include pitting, spalling, cracking, honeycombing, surface color and texture irregularities, air bubbles, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning. Immediately repair or replace concrete and place in satisfactory condition in every particular, any guaranteed work upon written notice from the Project Manager or Architect and make good all damage to the buildings and grounds caused by said work, without cost to the Owner.
  - 2. Warranty Period: 2 years from date of Substantial Completion.
- B. Guarantee for New Replacement Work: Provide similar, new 2-year guarantee from date of completion of replacement work.

### PART 2 - PRODUCTS

#### 2.1 FORM-FACING MATERIALS

- A. Typical Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
  - 1. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
- B. Forms for High Quality Architectural, Smooth-Formed Finish Concrete: Plywood as indicated below to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings.
  - 1. Use 3/4-inch high-density overlay undamaged plywood complying with U.S. Product Standard PS-1 "A-C or B-B High-Density Overlay Concrete Form," Class I, or better.

2. In addition to ACI 303.1 limits on form-facing panel deflection, limit cast-in-place architectural concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows: Class A, 1/8 inch
- C. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- D. Void Forms: Biodegradable paper surface, treated for moisture resistance, structurally sufficient to support weight of plastic concrete and other superimposed loads.
- E. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.
- F. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.
- G. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
  1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- H. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
  1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
  2. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.
  3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

## 2.2 STEEL REINFORCEMENT

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- C. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed.
- D. Plain-Steel Wire: ASTM A 82/A 82M, as drawn.
- E. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain, fabricated from as-drawn steel wire into flat sheets.

### 2.3 REINFORCEMENT ACCESSORIES

- A. Epoxy-Coated Joint Dowel Bars: ASTM A 615/A 615M, Grade 60, plain-steel bars, ASTM A 775/A 775M epoxy coated.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
  - 1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

### 2.4 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
  - 1. Portland Cement: ASTM C 150, Type I/II, gray. Supplement with the following:
    - a. Fly Ash: ASTM C 618, Class F.
    - b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
- B. Normal-Weight Aggregates: ASTM C 33, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.
  - 1. Maximum Coarse-Aggregate Size: Per General Structural Notes.
  - 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Water: ASTM C 94/C 94M and potable.
- D. Aggregates at Polished Floor Surfaces: Add glass pieces and aggregates of sizes approved by Architect to achieve polished floor appearance matching Architect's Sample.
  - 1. Where indicated in pediatric Building, Provide the following Retro-Plate systems:
    - a. RetroPlate-Polished Concrete.
    - b. RetroPlate-Polished Concrete with Glass Mix.

### 2.5 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C 260.
- B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those

permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM 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. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

## 2.6 FIBER REINFORCEMENT

- A. Synthetic Micro-Fiber: fibrillated polypropylene micro-fibers engineered and designed for use in concrete, complying with ASTM C 1116/C 1116M, Type III, 1/2 to 1-1/2 inches long.
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. Fibrillated Micro-Fibers:
      - 1) Axim Italcementi Group, Inc.; Fibrasol F.
      - 2) Euclid Chemical Company (The), an RPM company; Fiberstrand F.
      - 3) FORTA Corporation.
      - 4) Grace Construction Products, W. R. Grace & Co.; Grace Fibers.
      - 5) Nycon, Inc.; ProConF.
      - 6) Propex Concrete Systems Corp.; Fibermesh 300.
      - 7) Sika Corporation; Sika Fiber PPF.

## 2.7 VAPOR RETARDERS

- A. Sheet Vapor Retarder: ASTM E 1745, Class A, except with maximum perm rating of 0.01 percent. Include manufacturer's recommended adhesive or pressure-sensitive tape.
1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Carlisle Coatings & Waterproofing, Inc.; Blackline 400.
    - b. Grace Construction Products, W. R. Grace & Co.; Florprufe 120.
    - c. Raven Industries Inc.; Vapor Block 15.
    - d. Stego Industries, LLC; Stego Wrap 15 mil Class A.

## 2.8 LIQUID FLOOR TREATMENTS

- A. VOC Content: Liquid floor treatments shall have a VOC content of 200 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

- B. Penetrating Liquid Floor Treatment for non-polished Exposed Concrete Floors: Clear, chemically reactive, waterborne solution of inorganic silicate or silicate materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces.
1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Conspec by Dayton Superior; Intraseal.
    - b. Curecrete Distribution Inc.; Ashford Formula.
    - c. Dayton Superior Corporation; Day-Chem Sure Hard (J-17).
    - d. Edoco by Dayton Superior; Titan Hard.
    - e. Euclid Chemical Company (The), an RPM company; Euco Diamond Hard.
    - f. L&M Construction Chemicals, Inc.; Seal Hard.
    - g. Meadows, W. R., Inc.; LIQUI-HARD.
    - h. Symons by Dayton Superior; Buff Hard.
    - i. US SPEC, Division of US Mix Products Company; US SPEC Industraseal.
    - j. Vexcon Chemicals, Inc.; Vexcon StarSeal PS Clear.
- C. Penetrating Liquid Floor Treatments for Polished Concrete Finish: Clear, waterborne solution of inorganic silicate or silicate materials and proprietary components; odorless; that penetrates, hardens, and is suitable for polished concrete surfaces.
1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Advanced Floor Products; Retro-Plate 99.
    - b. L&M Construction Chemicals, Inc.; FGS Hardener Plus.
    - c. QuestMark, a division of CentiMark Corporation; DiamondQuest Densifying Impregnator Application.

## 2.9 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. BASF Construction Chemicals - Building Systems; Confilm.
    - b. ChemMasters; SprayFilm.
    - c. Conspec by Dayton Superior; Aquafilm.
    - d. Dayton Superior Corporation; Sure Film (J-74).
    - e. Edoco by Dayton Superior; BurkeFilm.
    - f. Euclid Chemical Company (The), an RPM company; Eucobar.
    - g. Kaufman Products, Inc.; Vapor-Aid.
    - h. L&M Construction Chemicals, Inc.; E-CON.
    - i. Meadows, W. R., Inc.; EVAPRE.
    - j. Metalcrete Industries; Waterhold.
    - k. Nox-Crete Products Group; MONOFILM.
    - l. Sika Corporation; SikaFilm.

- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Potable.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Anti-Hydro International, Inc.; AH Curing Compound #2 DR WB.
    - b. BASF Construction Chemicals - Building Systems; Kure 200.
    - c. ChemMasters; Safe-Cure Clear.
    - d. Conspec by Dayton Superior; W.B. Resin Cure.
    - e. Dayton Superior Corporation; Day-Chem Rez Cure (J-11-W).
    - f. Edoco by Dayton Superior; Res X Cure WB.
    - g. Euclid Chemical Company (The), an RPM company; Kurez W VOX; TAMMSCURE WB 30C.
    - h. Kaufman Products, Inc.; Thinfilm 420.
    - i. Meadows, W. R., Inc.; 1100-CLEAR.
    - j. Nox-Crete Products Group; Resin Cure E.

## 2.10 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.
- B. Bonding Agent: ASTM C 1059/C 1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- C. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:
  - 1. Types I and II, non-load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
- D. Reglets: Fabricate reglets of not less than 0.022-inch- thick, galvanized-steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.
- E. Dovetail Anchor Slots: Hot-dip galvanized-steel sheet, not less than 0.034 inch thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

## 2.11 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
  2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
  3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
  4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109/C 109M.
- B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.
1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
  2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
  3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
  4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109/C 109M.

## 2.12 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
1. Fly Ash: 25 percent.
- C. Limit water-soluble, chloride-ion content in hardened concrete to 0.06 percent by weight of cement.
- D. Admixtures: Use admixtures according to manufacturer's written instructions.
1. Use water-reducing high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.

2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.

## 2.13 CONCRETE MIXTURES FOR BUILDING ELEMENTS

### A. Footings: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 3000 psi at 28 days.
2. Maximum Water-Cementitious Materials Ratio: 0.50.
3. Slump Limit: 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch or 5 inches, plus or minus 1 inch without water-reducing or plasticizing admixtures.

### B. Exterior Foundation Walls: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 4500 psi at 28 days.
2. Maximum Water-Cementitious Materials Ratio: 0.45.
3. Slump Limit: 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch, or 4 inches, plus or minus 1 inch without water-reducing or plasticizing admixtures.
4. Air Content: 5 percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch nominal maximum aggregate size.

### C. Interior Slabs-on-Grade: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 3000 psi at 28 days.
2. Slump Limit: : 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch or 4 inches, plus or minus 1 inch without water-reducing or plasticizing admixtures.
3. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.
4. Shrinkage Limit: Not more than 0.04 percent.

### D. Suspended Slabs, Slabs on Metal Deck and Interior Walls: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 4000 psi at 28 days.
2. Slump Limit: 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch or 4 inches, plus or minus 1 inch without water-reducing or plasticizing admixtures.
3. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.
4. Synthetic Micro-Fiber (slabs on metal deck only): Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than 2.0 lb/cu. yd..

### E. Tunnel lids and all other Site Cast Concrete: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 4500 psi at 28 days.
2. Maximum Water-Cementitious Materials Ratio: 0.45.
3. Slump Limit: 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch or 4 inches, plus or minus 1 inch without water-reducing or plasticizing admixtures.
4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch nominal maximum aggregate size.

#### 2.14 FABRICATING REINFORCEMENT

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

#### 2.15 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116M, and furnish batch ticket information.
  1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

### PART 3 - EXECUTION

#### 3.1 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
  1. Class A, 1/8 inch for smooth-formed finished surfaces.
  2. Class B, 1/4 inch for rough-formed finished surfaces.
- D. Construct forms tight enough to prevent loss of concrete mortar.
- E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
  1. Install keyways, reglets, recesses, and the like, for easy removal.
  2. Do not use rust-stained steel form-facing material.

- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- H. Chamfer exterior corners and edges of permanently exposed concrete.
- I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

### 3.2 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  - 1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
  - 2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
  - 3. Install dovetail anchor slots in concrete structures as indicated.

### 3.3 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations and curing and protection operations need to be maintained.
  - 1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.

2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

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

### 3.4 SHORES AND RESHORES

- A. Comply with ACI 318 and ACI 301 for design, installation, and removal of shoring and reshoring.
  - 1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.
- B. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

### 3.5 VAPOR RETARDERS

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.
  - 1. Lap joints 6 inches and seal with manufacturer's recommended tape.
- B. Do not cover vapor retarder with granular material.

### 3.6 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
  - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
  - 1. Weld reinforcing bars according to AWS D1.4/D 1.4M, where indicated.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

- E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.
- F. Epoxy-Coated Reinforcement: Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963/D 3963M. Use epoxy-coated steel wire ties to fasten epoxy-coated steel reinforcement.

### 3.7 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
  - 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
  - 2. Form keyed joints or provide intentionally roughened surfaces of ¼" amplitude as indicated. Embed keys at least 1-1/2 inches into concrete.
  - 3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
  - 4. Locate horizontal joints in walls and columns as indicated.
  - 5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
  - 1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
  - 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
  - 1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
  - 2. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

- E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

### 3.8 WATERSTOPS

- A. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions, adhesive bonding, mechanically fastening, and firmly pressing into place. Install in longest lengths practicable.

### 3.9 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.
- C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
  - 1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
  - 1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
  - 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
  - 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
  - 1. 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, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
- F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
  2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
  3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- G. Hot-Weather Placement: Comply with ACI 301 and as follows:
1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
  2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.
- 3.10 FINISHING FORMED SURFACES
- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
1. Apply to concrete surfaces not exposed to public view and not receiving waterproofing.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
1. Apply to concrete surfaces to be covered with a coating or covering material applied directly to concrete.
- C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

### 3.11 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.
  - 1. Apply float finish to surfaces to receive trowel finish or to be covered with waterproofing.
- C. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
  - 1. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
  - 2. Finish surfaces to the following tolerances, according to ASTM E 1155, for a randomly trafficked floor surface:
    - a. Specified overall values of flatness at carpeted areas, F(F) 25; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 17; and of levelness, F(L) 15.
    - b. Specified overall values of flatness at resilient flooring and exposed concrete, F(F) 30; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 15; for suspended slabs.
  - 3. Finish and measure surface so gap at any point between concrete surface and an unlevelled, freestanding, 10-ft.- long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/8 inch.
- D. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom.
  - 1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.
- E. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.
  - 1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

### 3.12 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations:
  - 1. Coordinate sizes and locations of concrete bases with actual equipment provided.
  - 2. Construct concrete bases as indicated; and extend base not less than 6 inches in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated or unless required for seismic anchor support.
  - 3. Minimum Compressive Strength: See Design Mixtures for suspended slabs or exterior slabs for requirements.
  - 4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
  - 5. Prior to pouring concrete, place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  - 6. Cast anchor-bolt insert into bases. Install anchor bolts to elevations required for proper attachment to supported equipment.

### 3.13 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
  - a. Water.
  - b. Continuous water-fog spray.
  - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
  - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
  - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
  - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
  - a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.

### 3.14 LIQUID FLOOR TREATMENTS

- A. Penetrating Liquid Floor Treatment for Unpolished Exposed Concrete Slabs: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions.
  1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
  2. Do not apply to concrete that is less than seven days' old.
  3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.
- B. Polished Concrete Floor Treatment: Apply polished concrete finish system to cured and prepared slabs to match accepted mockup.

1. Machine grind floor surfaces with 400 grit to receive polished finishes level and smooth and to depth required to reveal aggregate to match approved mockup.
  2. Apply penetrating liquid floor treatment for polished concrete in polishing sequence and according to manufacturer's written instructions, allowing recommended drying time between successive coats.
  3. Continue polishing with progressively finer grit diamond polishing pads to gloss level to match approved mockup.
  4. Control and dispose of waste products produced by grinding and polishing operations.
  5. Neutralize and clean polished floor surfaces.
- C. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller according to manufacturer's written instructions.

### 3.15 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
1. Defer joint filling until concrete has aged at least one month(s). Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

### 3.16 CONCRETE SURFACE REPAIRS

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

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

3.17 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Inspections:
1. Steel reinforcement placement.
  2. Steel reinforcement welding.
  3. Anchor bolts, rods, and studs.
  4. Verification of use of required design mixture.
  5. Concrete placement, including conveying and depositing.
  6. Curing procedures and maintenance of curing temperature.
  7. Verification of concrete strength before removal of shores and forms from beams and slabs.
- C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
1. Testing Frequency: Obtain at least one composite sample for each 150 cu. yd. or fraction thereof of each concrete mixture placed each day, nor less than 5000 square feet of slab on grade.
    - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
  2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
  3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
  4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
  5. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
  6. Compression Test Specimens: ASTM C 31/C 31M.
    - a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
  7. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
    - a. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

8. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
  9. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
  10. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
  11. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
  12. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
  13. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.
- D. Measure floor and slab flatness and levelness according to ASTM E 1155 within 24 hours of finishing.

### 3.18 PROTECTION OF EXPOSED TO VIEW CONCRETE FLOORS

- A. Protect exposed concrete floors from damage, staining, and wear. Cover all exposed concrete floors with plastic and plywood protective covering and keep covered for the remainder of construction period. Make sure no solvents, oils, or liquids are allowed to reach the concrete. **Do not allow threading of any plumbing or fire lines over exposed to view concrete floors even when protected with plywood.**

END OF SECTION 03 3000

## SECTION 03 3300 - ARCHITECTURAL CONCRETE

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes cast-in-place architectural concrete including form facings, reinforcement accessories, concrete materials, concrete mixture design, placement procedures, and finishes.
- B. Related Requirements:
  - 1. Section 07 9200 "Joint Sealants" for elastomeric joint sealants in contraction and other joints in cast-in-place architectural concrete.
  - 2. Section 32 1313 "Concrete Paving" for concrete pavement and flatwork finishes.

#### 1.2 DEFINITIONS

- A. Cast-in-Place Architectural Concrete: Formed concrete that is exposed to view on surfaces of completed structure or building and that requires special concrete materials, formwork, placement, or finishes to obtain specified architectural appearance.
- B. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.
- C. Design Reference Sample: Sample designated by Architect in the Contract Documents that reflects acceptable surface quality and appearance of cast-in-place architectural concrete.

#### 1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
  - 1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place architectural concrete to attend, including the following:
    - a. Contractor's superintendent.
    - b. Independent testing agency responsible for concrete design mixtures.
    - c. Ready-mix concrete manufacturer.
    - d. Cast-in-place architectural concrete subcontractor.
  - 2. Review concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction joints, forms and form-removal limitations,

reinforcement accessory installation, concrete repair procedures, and protection of cast-in-place architectural concrete.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. LEED Submittals:
  - 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 cost for each product having recycled content.
  - 2. Design Mixtures for Credit ID 1.1: For each concrete mixture containing fly ash as a replacement for portland cement or other portland cement replacements and for equivalent concrete mixtures that do not contain portland cement replacements.
- C. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
  - 1. Indicate amounts of mixing water to be withheld for later addition at Project site.
  - 2. Include 28-day mix design compressive strength histories as per ACI 318.
- D. Formwork Shop Drawings: Show formwork construction including form-facing joints, construction and contraction joints, joint-sealant details, form tie locations and patterns, inserts and embedments, cutouts, cleanout panels, and other items that visually affect cast-in-place architectural concrete.
- E. Samples: For each of the following materials:
  - 1. Form-facing boards.
  - 2. Form ties.
  - 3. Coarse- and fine-aggregate gradations.
  - 4. Rustications.
- F. Samples for Verification: Architectural concrete Samples, cast vertically, approximately 18 by 18 by 2 inches, of finishes, colors, and textures to match design reference sample. Include Sample sets showing the full range of variations expected in these characteristics.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For each of the following:
  - 1. Cementitious materials.
  - 2. Admixtures.
  - 3. Form materials and form-release agents.

4. Repair materials.

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

1. Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali-aggregate reactivity.

#### 1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "NRMCA Quality Control Manual - Section 3, Certification of Ready Mixed Concrete Production Facilities."

B. Testing Agency Qualifications: Qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.

2. Personnel performing laboratory tests shall be an ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.

C. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301, "Specification for Structural Concrete," Sections 1 through 5.

2. ACI 303.1, "Specification for Cast-in-Place Architectural Concrete."

D. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

E. Sample Panel Mockups: Before casting architectural concrete, cast a 5-foot by 8-foot or full-size Sample mockup to verify selections made under sample submittals and to demonstrate typical joints, surface finish, texture, color, tolerances, and standard of workmanship. Obtain Architect's acceptance of visual qualities. Maintain sample panel exposed to view for duration of concrete work. Build mockups to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups in the location and of the size as directed by Architect.

2. Build mockups of typical exterior wall of cast-in-place architectural concrete as shown on Drawings.

3. Demonstrate curing, cleaning, and protecting of cast-in-place architectural concrete, finishes, and contraction joints, as applicable.

4. In presence of Architect, damage part of the exposed-face surface for each finish, color, and texture, and demonstrate materials and techniques proposed for repair of tie holes and surface blemishes to match adjacent undamaged surfaces.
5. Obtain Architect's approval of mockups before casting architectural concrete.

## PART 2 - PRODUCTS

### 2.1 FORM-FACING MATERIALS

- A. General: Comply with Section 03 3000 "Cast-in-Place Concrete" for formwork and other form-facing material requirements.
- B. Form Liners: Do not use pre-manufactured plastic or vinyl form-liners.
- C. Board Faced Form Materials for As-Cast Finishes: Rough-sawn, 1 by 2-inch cedar boards nailed horizontally at random lengths, to exposed face of exterior-grade plywood panels, nonabsorptive, that will provide continuous, true, board-formed architectural concrete surfaces,, complying with DOC PS 1.
- D. Form Joint Tape: Compressible foam tape; pressure sensitive; AAMA 800, "Specification 810.1, Expanded Cellular Glazing Tape"; minimum 1/4 inch thick.
- E. Form Joint Sealant: Elastomeric sealant complying with ASTM C 920, Type M or Type S, Grade NS, that adheres to form joint substrates.
- F. Sealer: Penetrating, clear, polyurethane wood form sealer formulated to reduce absorption of bleed water and prevent migration of set-retarding chemicals from wood.
- G. Form-Release Agent: Commercially formulated, colorless form-release agent that will not bond with, stain, or adversely affect architectural concrete surfaces and will not impair subsequent treatments of those surfaces.
  1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- H. Form Ties: Factory-fabricated, glass-fiber-reinforced plastic ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
  1. Furnish glass-fiber-reinforced plastic ties, not less than 1/2 inch in diameter, of color selected by Architect from manufacturer's full range.
    - a. Basis of Design: Supertie or Supertie XV as manufactured by RJD Industries, Inc., or an equivalent fiberglass form tie system approved by Architect prior to bid and complying with requirements.

## 2.2 STEEL REINFORCEMENT AND ACCESSORIES

- A. General: Comply with Section 033000 "Cast-in-Place Concrete" for steel reinforcement and other requirements for reinforcement accessories.
- B. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- C. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire fabric in place; manufacture according to CRSI's "Manual of Standard Practice."
  - 1. Where legs of wire bar supports contact forms, use gray, all-plastic or CRSI Class 2, stainless-steel bar supports.

## 2.3 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
  - 1. Portland Cement: ASTM C 150, Type I/II, gray. Supplement with the following:
    - a. Fly Ash: ASTM C 618, Class F.
- B. Normal-Weight Aggregates: ASTM C 33, Class 5S coarse aggregate or better, graded. Provide aggregates from single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.
  - 1. Maximum Coarse-Aggregate Size: 3/4 inch.
  - 2. Gradation: Uniformly graded.
- C. Normal-Weight Fine Aggregate: ASTM C 33 or ASTM C 144, manufactured or natural sand, from same source for entire Project.
- D. Water: Potable, complying with ASTM C 94/C 94M except free of wash water from mixer washout operations.

## 2.4 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C 260.
- B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

C. Color Pigment: ASTM C 979, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, nonfading, and resistant to lime and other alkalis.

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

## 2.5 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.

1. For integrally colored concrete, curing compound shall be pigmented type approved by color pigment manufacturer.

## 2.6 REPAIR MATERIALS

A. Bonding Agent: ASTM C 1059/C 1059M, Type II, nonredispersible, acrylic emulsion or styrene butadiene.

B. Epoxy Bonding Adhesive: ASTM C 881/C 881M, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements.

1. Types I and II, non-load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

## 2.7 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of cast-in-place architectural concrete proportioned on basis of laboratory trial mixture or field test data, or both, according to ACI 301.

1. Use a qualified independent testing agency for preparing and reporting proposed design mixtures based on laboratory trial mixtures.

B. Proportion concrete mixtures as follows:

1. Compressive Strength (28 Days): 4500 psi.
2. Maximum Water-Cementitious Materials Ratio: 0.45.

3. Slump Limit: 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.
  4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch nominal maximum aggregate size.
- C. Cementitious Materials: For cast-in-place architectural concrete exposed to deicers, limit percentage, by weight, of cementitious materials other than portland cement according to ACI 301 requirements.
- D. Limit water-soluble, chloride-ion content in hardened concrete to 0.06 percent by weight of cement.
- E. Admixtures: Use admixtures according to manufacturer's written instructions.
- F. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.

## 2.8 CONCRETE MIXING

- A. Ready-Mixed Architectural Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and furnish batch ticket information.
1. Clean equipment used to mix and deliver cast-in-place architectural concrete to prevent contamination from other concrete.
  2. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

## PART 3 - EXECUTION

### 3.1 FORMWORK

- A. General: Comply with Section 03 3000 "Cast-in-Place Concrete" for formwork, embedded items, and shoring and reshoring.
- B. Limit deflection of form-facing panels to not exceed ACI 303.1 requirements.
- C. In addition to ACI 303.1 limits on form-facing panel deflection, limit cast-in-place architectural concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
1. Class B, 1/4 inch.
- D. Fabricate forms to result in cast-in-place architectural concrete that complies with ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

- E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast-in-place surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical. Kerf wood rustications, keyways, reglets, recesses, and the like, for easy removal.
  - 1. Seal form joints and penetrations at form ties with form joint tape or form joint sealant to prevent cement paste leakage.
  - 2. Do not use rust-stained steel form-facing material.
- F. Do not chamfer exterior corners and edges of cast-in-place architectural concrete.
- G. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- H. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- I. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- J. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.
- K. Place form boards accurately to provide finished surface texture indicated. Provide solid backing and attach securely to prevent deflection and maintain stability of lining during concreting. Seal joints of forms and form lining to prevent mortar leaks. Coat form lining boards with form-release agent. Add 1 inch to width of formwork and form ties to accommodate nominal 1 by 2 inch boards where required for board-formed finish and so as not to reduce scheduled wall thickness.
- L. Fiberglass Form Ties: Install form ties per form tie manufacturer's written instructions. Finish by grinding fiberglass form ties flush with the finished surface.

### 3.2 REINFORCEMENT AND INSERTS

- A. General: Comply with Section 033000 "Cast-in-Place Concrete" for fabricating and installing steel reinforcement. Securely fasten steel reinforcement and wire ties against shifting during concrete placement.
- B. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

### 3.3 REMOVING AND REUSING FORMS

- A. Formwork that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete if concrete is hard enough to not be damaged by form-removal operations and curing and protection operations are maintained.

1. Schedule form removal to maintain surface appearance that matches approved field sample panels.
  2. Cut off and grind glass-fiber-reinforced plastic form ties flush with surface of concrete.
- B. Clean and repair surfaces of forms to be reused in the Work. Do not use split, frayed, delaminated, or otherwise damaged form-facing material. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for cast-in-place architectural concrete surfaces.

### 3.4 JOINTS

- A. Construction Joints: Install construction joints true to line with faces perpendicular to surface plane of cast-in-place architectural concrete so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated.
  2. Form keyed joints or intentionally roughened surfaces as indicated. Embed keys at least 1-1/2 inches into concrete. Align construction joint within rustications attached to form-facing material.
  3. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
- B. Contraction Joints: Form weakened-plane contraction joints true to line with faces perpendicular to surface plane of cast-in-place architectural concrete so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

### 3.5 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, form-release agent, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.
- C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- D. Deposit concrete continuously between construction joints. Deposit concrete to avoid segregation.

1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
  2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 303.1.
  3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. Do not permit vibrators to contact forms.
- E. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
  2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
  3. Do not use calcium chloride, salt, or other materials containing antifreeze agents.
  4. Do not use chemical accelerators unless otherwise specified and approved in design mixtures.
- F. Hot-Weather Placement: Comply with ACI 301 and as follows:
1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
  2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

### 3.6 FINISHES, GENERAL

- A. Architectural Concrete Finish: Match Architect's design reference sample, identified and described as indicated, to satisfaction of Architect.
- B. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces.
  1. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.
- C. Maintain uniformity of special finishes over construction joints unless otherwise indicated.

### 3.7 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with ACI 301 for hot-weather protection during curing.
- B. Begin curing cast-in-place architectural concrete immediately after removing forms from concrete. Cure according to ACI 308.1, by one or a combination of the following methods that will not mottle, discolor, or stain concrete:
  - 1. Moisture Curing: Keep exposed surfaces of cast-in-place architectural concrete continuously moist for no fewer than seven days with the following materials:
    - a. Water.
    - b. Continuous water-fog spray.
    - c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
  - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for no fewer than seven days. Immediately repair any holes or tears during curing period; use cover material and waterproof tape.
  - 3. Curing Compound: Mist concrete surfaces with water. Apply curing compound uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

### 3.8 FIELD QUALITY CONTROL

- A. General: Comply with field quality-control requirements in Section 033000 "Cast-in-Place Concrete."

### 3.9 REPAIRS, PROTECTION, AND CLEANING

- A. Repair and cure damaged finished surfaces of cast-in-place architectural concrete when approved by Architect. Match repairs to color, texture, and uniformity of surrounding surfaces and to repairs on approved mockups.
  - 1. Remove and replace cast-in-place architectural concrete that cannot be repaired and cured to Architect's approval.
- B. Protect corners, edges, and surfaces of cast-in-place architectural concrete from damage; use guards and barricades.

- C. Protect cast-in-place architectural concrete from staining, laitance, and contamination during remainder of construction period.
- D. Clean cast-in-place architectural concrete surfaces after finish treatment to remove stains, markings, dust, and debris.
- E. Wash and rinse surfaces according to concrete finish applicator's written instructions. Protect other Work from staining or damage due to cleaning operations.
  - 1. Do not use cleaning materials or processes that could change the appearance of cast-in-place architectural concrete finishes.

END OF SECTION 03 3300

## SECTION 03 4800 - PRECAST CONCRETE BENCH ARMS

### 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. Precast concrete benches.

- B. Related Sections:

- 1. Section 06 4600 "Wood Shelving and Miscellaneous Millwork" for wood bench seats between precast concrete bench arms.

#### 1.3 ACTION SUBMITTALS

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

- 1. For precast concrete units, include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

- B. Shop Drawings: Show fabrication and installation details for precast concrete specialties. Include dimensions, details of reinforcement and anchorages if any, and indication of finished faces.

- C. Full-Size Samples: For shape of precast concrete bench arms required.

- 1. Make available for Architect's review at Project site or at manufacturing plant, if acceptable to Architect.
- 2. Make Samples from materials to be used for units used on Project immediately before beginning production of units for Project.
- 3. Approved Samples may be installed in the Work.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer.

1. Include copies of material test reports for completed projects, indicating compliance of precast concrete with ASTM C 1364.

B. Material Test Reports: For each mix required to produce precast units, based on testing according to ASTM C 1364, including test for resistance to freezing and thawing.

1. Provide test reports based on testing within previous two years.

#### 1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer of precast concrete specialties similar to those indicated for this Project, that has sufficient production capacity to manufacture required units, and is a plant certified by the Precast concrete Institute or the Precast/Prestressed Concrete Institute for Group A, Category AT.

B. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color, from one manufacturer for each cementitious component and from one source or producer for each aggregate.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

A. Coordinate delivery of precast concrete bench arms with unit masonry work to avoid delaying the Work.

B. Pack, handle, and ship precast concrete bench arms in suitable packs or pallets.

1. Lift with wide-belt slings; do not use wire rope or ropes that might cause staining. Move precast concrete bench arms, if required, using dollies with wood supports.

2. Store precast concrete bench arms on wood skids or pallets with nonstaining, waterproof covers, securely tied. Arrange to distribute weight evenly and to prevent damage to units. Ventilate under covers to prevent condensation.

C. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

D. Store mortar aggregates where grading and other required characteristics can be maintained and contamination can be avoided.

#### 1.7 PROJECT CONDITIONS

A. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Comply with cold-weather construction requirements in ACI 530.1/ASCE 6/TMS 602.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until precast concrete has dried, but no fewer than seven days after completing cleaning.
- B. Hot-Weather Requirements: Comply with hot-weather construction requirements in ACI 530.1/ASCE 6/TMS 602.

## PART 2 - PRODUCTS

### 2.1 PRECAST CONCRETE MATERIALS

- A. General: Comply with ASTM C 1364 and the following:
- B. Portland Cement: ASTM C 150, Type I or Type III, containing not more than 0.60 percent total alkali when tested according to ASTM C 114.
  1. Provide white cement.
- C. Coarse Aggregates: Granite, quartz, or limestone complying with ASTM C 33; gradation and colors as needed to produce required precast concrete textures and colors.
- D. Fine Aggregates: Natural sand or crushed stone complying with ASTM C 33, gradation and colors as needed to produce required precast concrete textures and colors.
- E. Admixtures: Use only admixtures specified or approved in writing by Architect.
  1. Do not use admixtures that contain more than 0.1 percent water-soluble chloride ions by mass of cementitious materials. Do not use admixtures containing calcium chloride.
  2. Use only admixtures that are certified by manufacturer to be compatible with cement and other admixtures used.
  3. Air-Entraining Admixture: ASTM C 260. Add to mixes for units exposed to the exterior at manufacturer's prescribed rate to result in an air content of 4 to 6 percent, except do not add to zero-slump concrete mixes.
  4. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
  5. Water-Reducing, Retarding Admixture: ASTM C 494/C 494M, Type D.
  6. Water-Reducing, Accelerating Admixture: ASTM C 494/C 494M, Type E.
- F. Reinforcement: Deformed steel bars complying with ASTM A 615/A 615M, Grade 60. Use galvanized or epoxy-coated reinforcement when covered with less than 1-1/2 inches of precast concrete material.
  1. Epoxy Coating: ASTM A 775/A 775M.
- G. Embedded Anchors and Other Inserts: Fabricated from stainless steel complying with ASTM A 240/A 240M, ASTM A 276, or ASTM A 666, Type 304.

## 2.2 PRECAST CONCRETE BENCH ARMS

- 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. Advanced Cast Stone, Inc.
  2. Architectural Facades Unltd., Inc.
  3. Baxter Precast, LLC
  4. Brailsford Cast Stone, Inc.
  5. Eagle Pre-cast Stone, Inc.
  6. Hanson Structural Precast Eagle
  7. Mesa Precast & Supply, LLC
  8. Northwest Precast
  9. Owell Precast LLC
  10. Rocky Mountain Prestress, Inc.
  11. Stresscon Corporation
  12. SW Architectural Castings.
  13. Upwall Pre-cast Concrete.
  14. Confab, Inc. Precast Concrete Products.
- B. Provide precast concrete units complying with ASTM C 1364 using either the vibrant dry tamp or wet-cast method.
- C. Fabricate units with sharp arris and accurately reproduced details, with indicated texture on all exposed surfaces unless otherwise indicated.
- D. Fabrication Tolerances:
1. Variation in Cross Section: Do not vary from indicated dimensions by more than 1/8 inch.
  2. Variation in Length: Do not vary from indicated dimensions by more than 1/360 of the length of unit or 1/8 inch, whichever is greater, but in no case by more than 1/4 inch.
  3. Warp, Bow, and Twist: Not to exceed 1/360 of the length of unit or 1/8 inch, whichever is greater.
  4. Location of False Joints, Holes, Anchorages, and Similar Features: Do not vary from indicated position by more than 1/8 inch on formed surfaces of units and 3/8 inch on unformed surfaces.
- E. Cure units as follows:
1. Cure units in enclosed moist curing room at 95 to 100 percent relative humidity and temperature of 100 deg F for 12 hours or 70 deg F for 16 hours.
  2. Keep units damp and continue curing to comply with one of the following:
    - a. No fewer than five days at mean daily temperature of 70 deg F or above.
    - b. No fewer than six days at mean daily temperature of 60 deg F or above.
    - c. No fewer than seven days at mean daily temperature of 50 deg F or above.
    - d. No fewer than eight days at mean daily temperature of 45 deg F or above.

- F. Acid etch units after curing to remove cement film from surfaces to be exposed to view.
- G. Colors and Textures: Polished surface matching Architect's Sample.

### 2.3 ACCESSORIES

- A. Anchors: Type and size indicated, fabricated from Type 304 stainless steel complying with ASTM A 240/A 240M, ASTM A 276, or ASTM A 666.
- B. Dowels: 1/2-inch- diameter, round bars, fabricated from Type 304 stainless steel complying with ASTM A 240/A 240M, ASTM A 276, or ASTM A 666.
- C. 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 precast concrete manufacturer and expressly approved by cleaner manufacturer for use on precast concrete and adjacent masonry materials.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Diedrich Technologies, Inc.
    - b. EaCo Chem, Inc.
    - c. ProSoCo, Inc.

### 2.4 SOURCE QUALITY CONTROL

- A. Engage a qualified independent testing agency to sample and test precast concrete units according to ASTM C 1364.
  - 1. Include one test for resistance to freezing and thawing.

## 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 work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION TOLERANCES

- A. Variation from Plumb: Do not exceed 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.

- B. Variation from Level: Do not exceed 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
- C. Variation in Joint Width: Do not vary joint thickness more than 1/8 inch in 36 inches or one-fourth of nominal joint width, whichever is less.
- D. Variation in Plane between Adjacent Surfaces (Lipping): Do not vary from flush alignment with adjacent units or adjacent surfaces indicated to be flush with units by more than 1/16 inch, except where variation is due to warpage of units within tolerances specified.

### 3.3 ADJUSTING AND CLEANING

- A. Remove and replace stained and otherwise damaged units and units not matching approved Samples. Precast concrete may be repaired if methods and results are approved by Architect.
- B. Replace units in a manner that results in precast concrete matching approved Samples, complying with other requirements, and showing no evidence of replacement.
- C. In-Progress Cleaning: Clean precast concrete as work progresses.
  - 1. Remove mortar fins and smears before tooling joints.
  - 2. Remove excess sealant immediately, including spills, smears, and spatter.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed precast concrete as follows:
  - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
  - 2. Test cleaning methods on sample; leave one sample uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of cast stone.
  - 3. Protect adjacent surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
  - 4. Wet surfaces with water before applying cleaners; remove cleaners promptly by rinsing thoroughly with clear water.
  - 5. Clean precast concrete by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
  - 6. Clean precast concrete with proprietary acidic cleaner applied according to manufacturer's written instructions.

END OF SECTION 03 4800

## SECTION 03 4805 - PRECAST CONCRETE BOLLARDS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes precast concrete bollards.

#### 1.2 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide precast concrete bollards and connections capable of withstanding the following design loads within limits and under conditions indicated:
  - 1. Thermal Movements: Provide for in-plane thermal movements resulting from annual ambient temperature changes of 120 deg F.
  - 2. Vehicular Impact Loads: Design bollards acting as vehicular barriers for passenger cars to resist a single 6000-lb service load and 10,000-lb ultimate load applied horizontally in any direction to the bollard. Design bollards assuming the load to act at a height of 18 inches above the floor or ramp surface on an area not to exceed 1 sq. ft.

#### 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For precast concrete mixture. Include compressive strength and water absorption tests.
- C. Shop Drawings: Detail fabrication and installation of precast concrete bollard. Indicate locations, plans, elevations, dimensions, shapes, and cross sections of each unit. Indicate joints, reveals, and extent and location of each surface finish.
  - 1. Indicate location of each precast concrete bollard by same identification mark placed on panel.
  - 2. Indicate relationship of precast concrete bollards to adjacent materials.
  - 3. 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.
- D. Samples: For each type of finish indicated on exposed surfaces of precast concrete bollards, in sets of 3, illustrating full range of finish, color, and texture variations expected; approximately 12 by 12 by 2 inches.
- E. Qualification Data: For fabricator.

- F. Material Test Reports: For aggregates.
- G. Material Certificates: For the following items, signed by manufacturers:
  - 1. Cementitious materials.
  - 2. Reinforcing materials.

#### 1.4 QUALITY ASSURANCE

- A. Fabricator Qualifications: A firm that assumes responsibility for engineering precast concrete bollards 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 at time of bidding 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. Design Standards: Comply with ACI 318 and design recommendations of PCI MNL 120, "PCI Design Handbook - Precast and Prestressed Concrete," applicable to types of precast concrete bollards indicated.
- C. 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."
- D. Mockups: Before production of precast concrete bollards, construct full-sized mockup to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
  - 1. Build mockup including one precast concrete bollard.
  - 2. Approved mockups may become part of the completed Work if undamaged at time of Substantial Completion.
  - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents unless such deviations are specifically approved by Architect in writing.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver precast concrete bollards 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.

## 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. Form Liners: Units of face design, arrangement, and configuration indicated. Furnish with manufacturer's recommended 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.
- C. 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. Supports: Suspend steel anchors and reinforcement from back of mold or use bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars 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.

- 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.
  - 1. Face-Mixture-Fine Aggregates: Selected, natural or manufactured sand of same material as coarse aggregate, unless otherwise approved by Architect.
- D. Coloring Admixture: ASTM C 979, synthetic or natural mineral-oxide pigments or colored water-reducing admixtures, temperature stable, and nonfading.
- E. 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.
- F. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.
- G. 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 ACCESSORIES

- A. Precast Accessories: Provide plastic plugs and other accessories required to install precast concrete units.

## 2.5 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.
- B. Design mixtures may be prepared by a qualified independent testing agency or by qualified precast plant personnel at 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.

## 2.6 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.
  - 1. Place form liners accurately to provide finished surface texture indicated. Provide solid backing and supports to maintain stability of liners during concrete placement. Coat form liner with form-release agent.
- B. Maintain molds to provide completed precast concrete bollards 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 radiused.

## 2.7 FABRICATION

- A. Cast-in threaded-Coil bolts, Inserts, and Other 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.
- B. Cast-in holes and other accessories in precast concrete bollards as indicated on the Contract Drawings.
- 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.
  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 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.
- D. Reinforce precast concrete bollards 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.
1. Place self-consolidating concrete without vibration according to PCI TR-6, "Interim Guidelines for the Use of Self-Consolidating Concrete in Precast/Prestressed Concrete Institute Member Plants."
- H. Comply with PCI MNL 117 for hot- and cold-weather concrete placement.
- I. Identify pickup points of precast concrete bollards and orientation in structure with permanent markings, complying with markings indicated on Shop Drawings. Imprint or permanently mark casting date on each precast concrete bollard on a surface that will not show in finished bollards.
- 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 precast concrete bollards that do not comply with requirements, including structural, manufacturing tolerance, and appearance, unless repairs meet requirements in PCI MNL 117 and Architect's approval.

## 2.8 FABRICATION TOLERANCES

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

## 2.9 FINISHES

- A. Bollard faces shall be free of joint marks, grain, and other obvious defects. Corners, including false joints shall be uniform and to radius indicated. Finish exposed-face surfaces of precast concrete bollards smooth and to match approved mockups.
  - 1. As-Cast Surface Finish: Provide smooth surfaces free of pockets, sand streaks, and honeycombs.
- B. Finish exposed top surfaces of precast concrete bollards to match face-surface finish.

## 2.10 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. 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 REPAIRS

- A. Repair precast concrete bollards 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. Remove and replace damaged precast concrete bollards when repairs do not comply with requirements.

3.2 CLEANING

- A. Clean deleterious material from concrete surfaces and adjacent materials immediately.
- B. Clean exposed surfaces of precast concrete bollards to remove 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 03 4805

## SECTION 04 2113 - BRICK MASONRY

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Face brick.
2. Mortar and grout.
3. Ties and anchors.
4. Embedded metal drip edge flashing.
5. Miscellaneous masonry accessories.

##### B. Related Sections:

1. Section 03 3000 "Cast-in-Place Concrete" for dovetail slots for masonry anchors.
2. Section 05 1200 "Structural Steel Framing" for installing anchor sections of adjustable masonry anchors for connecting to structural steel frame.
3. Section 05 5000 "Metal Fabrications" for furnishing steel lintels and relief/ledger angles for brick masonry.
4. Section 07 2713 "Modified Bituminous Sheet Air Barriers" for flexible flashing installed behind brick masonry.

#### 1.2 ACTION SUBMITTALS

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

##### B. LEED Submittals:

1. Product Certificates for Credit MR 5: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

##### C. Shop Drawings: For the following:

1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
2. Fabricated Drip Edge Flashing: Detail corner units and other special applications.

##### D. Samples for Initial Selection:

1. Face brick, in the form of straps of five or more bricks.
2. Colored mortar.

3. Weep holes/vents.

E. Samples for Verification: For each type and color of the following:

1. Face brick, in the form of straps of five or more bricks.
2. Special brick shapes.
3. Pigmented mortar. Make Samples using same sand and mortar ingredients to be used on Project.
4. Weep holes.
5. Accessories embedded in masonry.

### 1.3 INFORMATIONAL SUBMITTALS

A. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.

1. Submittal is for information only. 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.

B. Material Certificates: For each type and size of the following:

1. Masonry units.
  - a. Include data on material properties.
  - b. For brick, include size-variation data verifying that actual range of sizes falls within specified tolerances.
  - c. For exposed brick, include test report for efflorescence according to ASTM C 67.
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. Anchors, ties, and metal accessories.

C. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

### 1.4 QUALITY ASSURANCE

A. 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, from single source from single manufacturer for each product required.

- B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.
- C. Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 602 unless modified by requirements in the Contract Documents.
- D. 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 each type of exposed unit masonry construction in sizes approximately 60 inches long by 60 inches high by full thickness, including accessories.
    - a. Include a sealant-filled joint at least 16 inches long in mockup.
    - b. Include lower corner of window opening at upper corner of 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, veneer anchors, flashing, cavity drainage material, and weep holes in mockup.
  - 2. Where masonry is to match existing, erect mockups adjacent and parallel to existing surface.
  - 3. Clean one-half of exposed faces of mockups with masonry cleaner as indicated.
  - 4. Protect accepted mockups from the elements with weather-resistant membrane.
  - 5. 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.
  - 6. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

#### 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 use with dispensing silos. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in covered weatherproof dispensing silos.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

#### 1.6 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 of walls and hold cover securely in place.
  - 2. Where one 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. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
  - 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.
- D. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

## PART 2 - PRODUCTS

### 2.1 MASONRY UNITS, GENERAL

- A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects will be exposed in the completed Work.
- B. Fire-Resistance Ratings: Where indicated, provide units that comply with requirements for fire-resistance ratings indicated as determined by testing according to ASTM E 119, by equivalent masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

### 2.2 BRICK

- A. Regional Materials: Brick shall be manufactured within 500 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.
- B. General: Provide shapes indicated and as follows, with exposed surfaces matching finish and color of exposed faces of adjacent units.
  - 1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
  - 2. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.
  - 3. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.
  - 4. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.
- C. Face Brick: Facing brick complying with ASTM C 216 or hollow brick complying with ASTM C 652, Class H40V (void areas between 25 and 40 percent of gross cross-sectional area).
  - 1. Grade: SW.
  - 2. Type: FBX
  - 3. Initial Rate of Absorption: Less than 30 g/30 sq. in. per minute when tested per ASTM C 67.
  - 4. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."
  - 5. 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 or shall have a history of successful use in Project's area.
  - 6. Size (Actual Dimensions): 3-5/8 inches wide by 2-1/4 inches high by 7-5/8 inches long.
  - 7. Where shown to "match existing," provide face brick matching color range, texture, and size of existing adjacent brickwork.

8. Color and Texture: Canyonstone, smooth finish, as provided by Interstate Brick. Match Architect's samples.

### 2.3 MORTAR MATERIALS

- A. Regional Materials: Aggregate for mortar, cement, and lime shall be extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.
- B. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
- C. Hydrated Lime: ASTM C 207, Type S.
- D. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
- E. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C 979. Use only pigments with a record of satisfactory performance in masonry mortar.
  1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Davis Colors; True Tone Mortar Colors.
    - b. Lanxess Corporation; Bayferrox Iron Oxide Pigments.
    - c. Solomon Colors, Inc.; SGS Mortar Colors.
- F. Colored Cement Product: Packaged blend made from portland cement and hydrated lime and mortar pigments, all complying with specified requirements, and containing no other ingredients.
  1. Colored Portland Cement-Lime Mix:
    - a. Products: Subject to compliance with requirements, provide one of the following:
      - 1) Capital Materials Corporation; Riverton Portland Cement Lime Custom Color.
      - 2) Holcim (US) Inc.; Rainbow Mortamix Custom Color Cement/Lime.
      - 3) Lafarge North America Inc.; Eaglebond Portland & Lime.
      - 4) Lehigh Cement Company; Lehigh Custom Color Portland/Lime Cement.
    2. Formulate blend as required to produce color indicated or, if not indicated, as selected from manufacturer's standard colors.
    3. Pigments shall not exceed 10 percent of portland cement by weight.
- G. Aggregate for Mortar: ASTM C 144.

1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
  2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
- H. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Euclid Chemical Company (The); Accelguard 80.
    - b. Grace Construction Products, W. R. Grace & Co. - Conn.; Morset.
    - c. Sonneborn Products, BASF Aktiengesellschaft; Trimix-NCA.
- I. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with concrete masonry units, containing integral water repellent by same manufacturer.
1. Products: Subject to compliance with requirements, provide one of the following:
    - a. ACM Chemistries, Inc.; RainBloc for Mortar.
    - b. BASF Aktiengesellschaft; Rheopel Mortar Admixture.
    - c. Grace Construction Products, W. R. Grace & Co. - Conn.; Dry-Block Mortar Admixture.

## 2.4 REINFORCEMENT

- A. Masonry Joint Reinforcement, General: ASTM A 951/A 951M.
- B. Masonry Joint Reinforcement for Veneers Anchored with Seismic Masonry-Veneer Anchors: Single 0.187-inch- diameter, hot-dip galvanized, carbon-steel continuous wire.

## 2.5 TIES AND ANCHORS

- A. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:
  1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M; with ASTM A 153/A 153M, Class B-2 coating.
  2. Galvanized Steel Sheet: ASTM A 653/A 653M, Commercial Steel, G60 zinc coating.
  3. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, with ASTM A 153/A 153M, Class B coating.
- B. Adjustable Anchors for Connecting to Concrete: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.

1. Connector Section: Dovetail tabs for inserting into dovetail slots in concrete and attached to tie section; formed from 0.060-inch- thick, steel sheet, galvanized after fabrication.
    - a. 0.064-inch- thick, galvanized sheet may be used at interior walls unless otherwise indicated.
  2. Tie Section: Same as for Adjustable Masonry-Veneer anchors.
- C. 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. Seismic Masonry-Veneer Anchors: Units consisting of a metal anchor section and a connector section designed to engage a continuous wire embedded in the veneer mortar joint.
    - a. Basis of Design Product: Subject to compliance with requirements, provide **HB-200/DA-213 Adjustable Veneer Anchors** as provide by **Hohmann & Barnard, Inc.**; or an equivalent adjustable veneer anchor approved by Architect prior to bid by one the following :
      - 1) Dayton Superior Corporation, Dur-O-Wal Division.
      - 2) Wire-Bond.
    - b. Fabricate sheet metal anchor sections and other sheet metal parts from 0.075-inch-thick, steel sheet, galvanized after fabrication.
  3. Stainless-Steel Drill Screws for Steel Studs: Proprietary fastener consisting of carbon-steel drill point and 300 Series stainless-steel shank, complying with ASTM C 954 except manufactured with hex washer head and neoprene or EPDM washer, No. 10 diameter by length required to penetrate steel stud flange with not less than three exposed threads.
    - a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      - 1) Dayton Superior Corporation, Dur-O-Wal Division; Stainless Steel SX Fastener.
      - 2) ITW Buildex; Scots long life Tek.

## 2.6 MISCELLANEOUS ANCHORS

- A. Unit Type Inserts in Concrete: Cast-iron or malleable-iron wedge-type inserts.

- B. Dovetail Slots in Concrete: Furnish dovetail slots with filler strips, of slot size indicated, fabricated from 0.034-inch, galvanized steel sheet.

## 2.7 EMBEDDED FLASHING MATERIALS

- A. Metal Flashing: Provide metal flashing complying with SMACNA's "Architectural Sheet Metal Manual" and as follows:

1. Stainless Steel: ASTM A 240/A 240M, Type 304, 0.016 inch thick.
2. Fabricate continuous flashings in sections 96 inches long minimum, but not exceeding 12 feet. Provide splice plates at joints of formed, smooth metal flashing.
3. Fabricate through-wall metal flashing embedded in masonry from stainless steel, with ribs at 3-inch intervals along length of flashing to provide an integral mortar bond.

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

- 1) Cheney Flashing Company; Cheney Flashing (Dovetail) or Cheney 3-Way Flashing (Sawtooth).
- 2) Keystone Flashing Company, Inc.; Keystone 3-Way Interlocking Thruwall Flashing.
- 3) Sandell Manufacturing Co., Inc.; Mechanically Keyed Flashing.

4. Metal Drip Edge: Fabricate from stainless steel. Extend at least 3 inches into wall and 1/2 inch out from wall, with outer edge bent down 30 degrees and hemmed.
5. Metal Sealant Stop: Fabricate from stainless steel. Extend at least 3 inches into wall and out to exterior face of wall. At exterior face of wall, bend metal back on itself for 3/4 inch and down into joint 1/4 inch to form a stop for retaining sealant backer rod.

- B. Application: Unless otherwise indicated, use the following:

1. Where flashing is indicated to receive counterflashing, use metal flashing.
2. Where flashing is indicated to be turned down at or beyond the wall face, use metal flashing.
3. Where flashing is partly exposed and is indicated to terminate at the wall face, use metal flashing with a drip edge.

- C. Solder and Sealants for Sheet Metal Flashings:

1. Solder for Stainless Steel: ASTM B 32, Grade Sn60, with acid flux of type recommended by stainless-steel sheet manufacturer.
2. Elastomeric Sealant: ASTM C 920, chemically curing silicone sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

- D. 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.

## 2.8 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 or PVC.
- B. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).
- C. Weep/Vent Products: Use the following unless otherwise indicated:
  - 1. Mesh Weep/Vent: Free-draining mesh; made from polyethylene strands, full height and width of head joint and depth 1/8 inch less than depth of outer wythe; in color selected from manufacturer's standard.
    - a. Available Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      - 1) Mortar Net USA, Ltd.; Mortar Net Weep Vents.
- D. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Advanced Building Products Inc.; Mortar Break.
    - b. Archovations, Inc.; CavClear Masonry Mat.
    - c. Dayton Superior Corporation, Dur-O-Wal Division; Polytite MortarStop.
    - d. Mortar Net USA, Ltd.; Mortar Net.
  - 2. Provide one of the following configurations:
    - a. Strips, full-depth of cavity and 10 inches high, with dovetail shaped notches 7 inches deep that prevent clogging with mortar droppings.

## 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. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Diedrich Technologies, Inc.
    - b. EaCo Chem, Inc.

- c. ProSoCo, Inc.

## 2.10 MORTAR 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.
  - 2. Use portland cement-lime mortar unless otherwise indicated.
  - 3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification. Provide Type N unless another type is indicated.
- D. Pigmented Mortar: Use colored cement product or select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products.
  - 1. Pigments shall not exceed 10 percent of portland cement by weight.
  - 2. Mix to match Architect's sample.
  - 3. Application: Use pigmented mortar for exposed mortar joints with the following units:
    - a. Face brick.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

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

### 3.2 INSTALLATION, GENERAL

- A. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.
- B. 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.

- C. 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.
- D. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested per ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.

### 3.3 TOLERANCES

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

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

#### B. Lines and Levels:

- 1. For bed joints and top surfaces of bearing walls do not vary from level by more than 1/4 inch in 10 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; do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.

2. 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.
3. 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 or stack bond as indicated; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
- C. 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.
- D. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- E. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

### 3.5 MORTAR BEDDING AND JOINTING

- A. Lay hollow brick as follows:
  1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
  2. With entire units, including areas under cells, fully bedded in mortar at starting course on footings.
- B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

### 3.6 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

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

1. Provide an open space not less than 1 inch wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
3. Space anchors as indicated.

### 3.7 ANCHORING MASONRY VENEERS

- A. Anchor masonry veneers to wall framing and concrete backup with seismic masonry-veneer anchors to comply with the following requirements:
1. Fasten screw-attached and seismic anchors through sheathing to wall framing and to concrete backup with metal fasteners of type indicated. Use two fasteners unless anchor design only uses one fastener.
  2. Insert slip-in anchors in metal studs as sheathing is installed. Provide one anchor at each stud in each horizontal joint between sheathing boards.
  3. Embed tie sections connector sections and continuous wire in masonry joints. Provide not less than 2 inches of air space between back of masonry veneer and face of sheathing.
  4. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
  5. Space anchors as indicated in General Structural Notes. Install additional anchors within 12 inches of openings and at intervals, not exceeding 8 inches, around perimeter.

### 3.8 EXPANSION JOINTS

- A. General: Install expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span expansion joints without provision to allow for in-plane wall or partition movement.
- B. Form expansion joints in brick as follows:
1. Build in compressible joint fillers where indicated.
  2. Form open joint full depth of brick wythe and of width indicated, but not less than 3/8 inch for installation of sealant and backer rod specified in Section 07 9200 "Joint Sealants."
- C. Provide horizontal, pressure-relieving joints by either leaving an air space or inserting a compressible filler of width required for installing sealant and backer rod specified in Section 07 9200 "Joint Sealants," but not less than 3/8 inch.
1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

### 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.
- B. Install flashing as follows unless otherwise indicated:
  - 1. Prepare surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
  - 2. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall and adhere flexible flashing to top of metal drip edge.
  - 3. Install metal flashing termination beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall and adhere flexible flashing to top of metal flashing termination.
  - 4. Cut flexible flashing off flush with face of wall after masonry wall construction is completed.
- C. Installation of flexible flashings is in Section 07 2713 "Modified Bituminous Sheet Air Barriers."
- D. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.
- E. 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 or open head joints to form weep holes.
  - 2. Space weep holes 24 inches o.c. unless otherwise indicated.
- F. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in "Miscellaneous Masonry Accessories" Article.
- G. Install vents in head joints in exterior wythes at spacing indicated. Use open head joints to form vents.
  - 1. Close cavities off vertically and horizontally with blocking in manner indicated. Install through-wall flashing and weep holes above horizontal blocking.

### 3.11 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to

perform tests and inspections. Retesting of materials that fail to meet specified requirements shall be done at Contractor's expense.

- B. Inspections: Level 1 special inspections according to the "International Building Code."
  - 1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
- C. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.

### 3.12 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
  - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
  - 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
  - 3. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
  - 4. Clean brick by bucket-and-brush hand-cleaning method described in "BIA Technical Notes 20."
  - 5. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.

### 3.13 MASONRY WASTE DISPOSAL

- A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.
- B. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.

1. Crush masonry waste to less than 4 inches in each dimension.
  2. Mix masonry waste with at least two parts of specified fill material for each part of masonry waste. Fill material is specified in Section 312000 "Earth Moving."
  3. Do not dispose of masonry waste as fill within 18 inches of finished grade.
- C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 04 2113

## SECTION 04 2200 - CONCRETE UNIT MASONRY

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Concrete masonry units.
2. Decorative oncrete masonry veneer units.
3. Decorative concrete masonry units.
4. Mortar and grout.
5. Steel reinforcing bars.
6. Masonry joint reinforcement.
7. Ties and anchors.
8. Embedded flashing.
9. Miscellaneous masonry accessories.

##### B. Related Sections:

1. Section 03 3000 "Cast-in-Place Concrete" for dovetail slots for masonry anchors.
2. Section 05 1200 "Structural Steel Framing" for installing anchor sections of adjustable masonry anchors for connecting to structural-steel frame.
3. Section 07 1900 "Water Repellents" for water repellents applied to concrete unit masonry.
4. Section 07 6200 "Sheet Metal Flashing and Trim" for sheet metal flashing and for furnishing manufactured reglets installed in masonry joints.

#### 1.2 DEFINITIONS

A. CMU(s): Concrete masonry unit(s).

B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

#### 1.3 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Owner will engage a qualified independent testing agency to perform preconstruction testing indicated below. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.

1. Concrete Masonry Unit Test: For each type of unit required, according to ASTM C 140 for compressive strength.
2. Mortar Test (Property Specification): For each mix required, according to ASTM C 109/C 109M for compressive strength.

3. Mortar Test (Property Specification): For each mix required, according to ASTM C 780 for compressive strength.
4. Grout Test (Compressive Strength): For each mix required, according to ASTM C 1019.
5. Prism Test: For each type of construction required if performing prism tests in lieu of unit strength method, according to ASTM C 1314.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. LEED Submittals:
  1. Product Certificates for Credit MR 5: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.
- C. Shop Drawings: For the following:
  1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
  2. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement." Show elevations of reinforced walls.
- D. Samples for Initial Selection:
  1. Decorative CMUs, in the form of small-scale units.
  2. Colored mortar.
  3. Weep holes/vents.
- E. Samples for Verification: For each type and color of the following:
  1. Decorative CMUs.
  2. Pigmented mortar. Make Samples using same sand and mortar ingredients to be used on Project.
  3. Accessories embedded in masonry.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.

1. Submittal is for information only. 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.
  - B. Qualification Data: For testing agency.
  - C. Material Certificates: For each type and size of the following:
    1. Masonry units.
      - a. Include data on material properties and material test reports substantiating compliance with requirements.
      - b. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.
    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. Reinforcing bars.
    6. Joint reinforcement.
    7. Anchors, ties, and metal accessories.
  - D. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
    1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91 for air content.
    2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.
  - E. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.
  - F. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.
- 1.6 QUALITY ASSURANCE
- A. Testing Agency Qualifications: Qualified according to ASTM C 1093 for testing indicated.
  - B. 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, from single source from single manufacturer for each product required.

- C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.
- D. Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 602 unless modified by requirements in the Contract Documents.
- E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
  - 1. Build mockups for each type of exposed unit masonry construction in sizes approximately 60 inches long by 60 inches high by full thickness, including face and backup wythes and accessories.
    - a. Include a sealant-filled joint at least 16 inches long in each exterior wall mockup.
    - b. Include lower corner of window opening at upper corner of 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).
  - 2. Protect accepted mockups from the elements with weather-resistant membrane.
  - 3. 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.
  - 4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- F. Preinstallation Conference: Conduct conference at Project site.

#### 1.7 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 use with dispensing silos. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in covered weatherproof dispensing silos.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

#### 1.8 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 of walls and hold cover securely in place.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.
- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
  - 1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
  - 2. Protect sills, ledges, and projections from mortar droppings.
  - 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
  - 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
  - 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than 7 days after completing cleaning.
- E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Provide structural unit masonry that develops indicated net-area compressive strengths at 28 days.
  - 1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.
  - 2. Determine net-area compressive strength of masonry by testing masonry prisms according to ASTM C 1314.

### 2.2 MASONRY UNITS, GENERAL

- A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects will be exposed in the completed Work.
- B. Fire-Resistance Ratings: Where indicated, provide units that comply with requirements for fire-resistance ratings indicated as determined by testing according to ASTM E 119, by equivalent masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

### 2.3 CONCRETE MASONRY UNITS

- A. Regional Materials: CMUs shall be manufactured within 500 miles of Project site from aggregates and cement that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.
- B. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
  - 1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
    - a. **Payne Building:** Provide square-edged units for outside corners unless otherwise indicated.
    - b. **Pediatric Facility:** Provide bullnose units for outside corners unless otherwise indicated.
- C. Integral Water Repellent: Provide units made with integral water repellent for exposed units.
  - 1. Integral Water Repellent: Liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested according to ASTM E 514 as a wall assembly made with mortar containing integral

water-repellent manufacturer's mortar additive, with test period extended to 24 hours, shall show no visible water or leaks on the back of test specimen.

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

- 1) ACM Chemistries, Inc.; RainBloc.
- 2) BASF Aktiengesellschaft; Rheapel Plus.
- 3) Grace Construction Products, W. R. Grace & Co. - Conn.; Dry-Block.

D. CMUs: ASTM C 90.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 1900 psi.
2. Density Classification: Lightweight unless otherwise indicated.
3. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.
4. Exposed Faces: Provide color and texture matching the range represented by Architect's sample.

E. Decorative CMUs: ASTM C 90.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 1900 psi.
2. Density Classification: Lightweight.
3. Size (Width): Manufactured to dimensions specified in "CMUs" Paragraph.
4. Pattern and Texture:

a. Standard pattern, ground-face finish. Match Architect's samples.

- 1) Also applies to veneered solid CMU.

b. Standard pattern, split-face finish. Match Architect's samples.

F. Colors:

**1. Payne Building:**

a. Honed block; Parchment color as provided by Buehner Block

**2. Pediatric Facility:**

a. Honed block: Oak color as provided by Buehner Block.

b. Split-face block: Oak color as provided by Buehner Block.

2.4 MASONRY LINTELS

A. General: Provide one of the following:

- B. Masonry Lintels: Built-in-place masonry lintels made from bond beam CMUs with reinforcing bars placed as indicated and filled with coarse grout. Temporarily support built-in-place lintels until cured.

## 2.5 MORTAR AND GROUT MATERIALS

- A. Regional Materials: Aggregate for mortar and grout, cement, and lime shall be extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.
- B. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
- C. Hydrated Lime: ASTM C 207, Type S.
- D. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
- E. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C 979. Use only pigments with a record of satisfactory performance in masonry mortar.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Davis Colors; True Tone Mortar Colors.
    - b. Lanxess Corporation; Bayferrox Iron Oxide Pigments.
    - c. Solomon Colors, Inc.; SGS Mortar Colors.
- F. Colored Cement Product: Packaged blend made from portland cement and hydrated lime and mortar pigments, all complying with specified requirements, and containing no other ingredients.
  - 1. Colored Portland Cement-Lime Mix:
    - a. Products: Subject to compliance with requirements, provide one of the following:
      - 1) Capital Materials Corporation; Riverton Portland Cement Lime Custom Color.
      - 2) Holcim (US) Inc.; Rainbow Mortamix Custom Color Cement/Lime.
      - 3) Lafarge North America Inc.; Eaglebond Portland & Lime.
      - 4) Lehigh Cement Company; Lehigh Custom Color Portland/Lime Cement.
    - 2. Formulate blend as required to produce color indicated or, if not indicated, as selected from manufacturer's standard colors.
    - 3. Pigments shall not exceed 10 percent of portland cement by weight.
- G. Aggregate for Mortar: ASTM C 144.

1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.

H. Aggregate for Grout: ASTM C 404.

I. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with CMUs, containing integral water repellent by same manufacturer.

1. Products: Subject to compliance with requirements, provide one of the following:
  - a. ACM Chemistries, Inc.; RainBloc for Mortar.
  - b. BASF Aktiengesellschaft; Rheopel Mortar Admixture.
  - c. Grace Construction Products, W. R. Grace & Co. - Conn.; Dry-Block Mortar Admixture.

J. Water: Potable.

## 2.6 REINFORCEMENT

A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60.

## 2.7 TIES AND ANCHORS

A. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated.

1. Mill-Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M; with ASTM A 641/A 641M, Class 1 coating.
2. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M; with ASTM A 153/A 153M, Class B-2 coating.
3. Galvanized Steel Sheet: ASTM A 653/A 653M, Commercial Steel, G60 zinc coating.
4. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, with ASTM A 153/A 153M, Class B coating.
5. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

## 2.8 MISCELLANEOUS ANCHORS

A. Unit Type Inserts in Concrete: Cast-iron or malleable-iron wedge-type inserts.

B. Dovetail Slots in Concrete: Furnish dovetail slots with filler strips, of slot size indicated, fabricated from 0.034-inch, galvanized steel sheet.

- C. Anchor Bolts: Headed or L-shaped steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153/A 153M, Class C; of dimensions indicated.
- D. Postinstalled Anchors: Torque-controlled expansion anchors or chemical anchors.
  - 1. Provide anchors meeting IBC 2009 and ACI 318-08 requirements for anchors in cracked concrete.
  - 2. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5 unless otherwise indicated.
  - 3. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy stainless-steel bolts.

## 2.9 EMBEDDED FLASHING MATERIALS

- A. Metal Flashing: Provide metal flashing complying with SMACNA's "Architectural Sheet Metal Manual" and as follows:
  - 1. Stainless Steel: ASTM A 240/A 240M, Type 304, 0.016 inch thick.
  - 2. Fabricate continuous flashings in sections 96 inches long minimum, but not exceeding 12 feet. Provide splice plates at joints of formed, smooth metal flashing.
  - 3. Fabricate through-wall flashing with snaplock receiver on exterior face where indicated to receive counterflashing.
  - 4. Fabricate through-wall flashing with drip edge unless otherwise indicated. Fabricate by extending flashing 1/2 inch out from wall, with outer edge bent down 30 degrees and hemmed.
  - 5. Fabricate metal drip edges for ribbed metal flashing from plain metal flashing of same metal as ribbed flashing and extending at least 3 inches into wall with hemmed inner edge to receive ribbed flashing and form a hooked seam. Form hem on upper surface of metal so that completed seam will shed water.
  - 6. Metal Drip Edge: Fabricate from stainless steel. Extend at least 3 inches into wall and 1/2 inch out from wall, with outer edge bent down 30 degrees and hemmed.
  - 7. Metal Sealant Stop: Fabricate from stainless steel. Extend at least 3 inches into wall and out to exterior face of wall. At exterior face of wall, bend metal back on itself for 3/4 inch and down into joint 1/4 inch to form a stop for retaining sealant backer rod.
  - 8. Metal Expansion-Joint Strips: Fabricate from stainless steel to shapes indicated.
- B. Application: Unless otherwise indicated, use the following:
  - 1. Where flashing is indicated to receive counterflashing, use metal flashing.
  - 2. Where flashing is indicated to be turned down at or beyond the wall face, use metal flashing.
  - 3. Where flashing is partly exposed and is indicated to terminate at the wall face, use metal flashing with a drip edge.
  - 4. Where flashing is fully concealed at veneer CMU, use flexible flashing specified in Section 07 2713 "Modified Bituminous Sheet Air Barriers."
- C. Solder and Sealants for Sheet Metal Flashings:

1. Solder for Stainless Steel: ASTM B 32, Grade Sn60, with acid flux of type recommended by stainless-steel sheet manufacturer.
2. Elastomeric Sealant: ASTM C 920, chemically curing urethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

D. 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.

## 2.10 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 or urethane.

B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

D. Weep/Vent Products at Veneered solid CMUs: Use the following unless otherwise indicated:

1. Mesh Weep/Vent: Free-draining mesh; made from polyethylene strands, full height and width of head joint and depth 1/8 inch less than depth of outer wythe; in color selected from manufacturer's standard.

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

- 1) Mortar Net USA, Ltd.; Mortar Net Weep Vents.

E. Cavity Drainage Material at Veneered solid CMUs: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.

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

- a. Advanced Building Products Inc.; Mortar Break.
- b. Archovations, Inc.; CavClear Masonry Mat.
- c. Dayton Superior Corporation, Dur-O-Wal Division; Polytite MortarStop.
- d. Mortar Net USA, Ltd.; Mortar Net.

2. Provide the following configurations:

- a. Strips, full-depth of cavity and 10 inches high, with dovetail shaped notches 7 inches deep that prevent clogging with mortar droppings.
- F. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and hold reinforcing bars in center of cells. Units are formed from 0.148-inch steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.
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. Dayton Superior Corporation, Dur-O-Wal Division; D/A 810, D/A 812 or D/A 817.
    - b. Heckmann Building Products Inc.; No. 376 Rebar Positioner.
    - c. Hohmann & Barnard, Inc.; #RB or #RB-Twin Rebar Positioner.
    - d. Wire-Bond; O-Ring or Double O-Ring Rebar Positioner.

## 2.11 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 masonry cement or mortar cement 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 the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.
1. For masonry below grade or in contact with earth, use Type S.
  2. For reinforced masonry, use Type S.
  3. For mortar parge coats, use Type S.
- D. Pigmented Mortar: Use colored cement product or select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products.
1. Pigments shall not exceed 10 percent of portland cement by weight.
  2. Mix to match Architect's sample.
  3. Application: Use pigmented mortar for exposed mortar joints with the following units:
    - a. Decorative CMUs.
- E. Grout for Unit Masonry: Comply with ASTM C 476.

1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
2. Proportion grout in accordance with ASTM C 476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi.
3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143/C 143M.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
  1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
  2. Verify that foundations are within tolerances specified.
  3. Verify that reinforcing dowels are properly placed.
- 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. Build chases and recesses to accommodate items specified in this and other Sections.
- B. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.
- C. 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.

#### 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.

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.

### 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 or stack bond as indicated; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
- C. 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 before laying fresh masonry.
- D. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

- E. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.
- F. 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.
- G. Fill cores in hollow CMUs with grout 24 inches deep by 48 inches wide (or greater) under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

### 3.5 MORTAR BEDDING AND JOINTING

- A. Lay hollow CMUs as follows:
  - 1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
  - 2. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.
- B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
- D. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

### 3.6 MASONRY JOINT REINFORCEMENT

- A. General: Where required, install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.
  - 1. Space integral brick veneer tie reinforcement not more than 16 inches o.c. for brick veneer anchorage.
- B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.
- C. Provide continuity at wall intersections by using prefabricated T-shaped units.
- D. Provide continuity at corners by using prefabricated L-shaped units.
- E. Cut and bend reinforcing units as directed by manufacturer for continuity at corners, returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

### 3.7 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

- A. Anchor masonry to structural steel and concrete where masonry abuts or faces structural steel or concrete to comply with the following:
  - 1. Anchor masonry with anchors embedded in masonry joints and attached to structure.
  - 2. Space anchors as indicated.

### 3.8 ANCHORING CMU VENEERS

- A. Anchor CMU veneers to wall framing and concrete backup with seismic masonry-veneer anchors to comply with the following requirements:
  - 1. Fasten screw-attached and seismic anchors through sheathing to wall framing and to concrete backup with metal fasteners of type indicated. Use two fasteners unless anchor design only uses one fastener.
  - 2. Insert slip-in anchors in metal studs as sheathing is installed. Provide one anchor at each stud in each horizontal joint between sheathing boards.
  - 3. Embed tie sections connector sections and continuous wire in masonry joints. Provide not less than 2 inches of air space between back of masonry veneer and face of sheathing.
  - 4. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
  - 5. Space anchors as indicated in General Structural Notes. Install additional anchors within 12 inches of openings and at intervals, not exceeding 8 inches, around perimeter.

### 3.9 CONTROL AND EXPANSION JOINTS

- A. General: Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.
- B. Form control joints in concrete masonry using one of the following methods:
  - 1. Fit bond-breaker strips into hollow contour in ends of CMUs on one side of control joint. Fill resultant core with grout and rake out joints in exposed faces for application of sealant.
  - 2. Install preformed control-joint gaskets designed to fit standard sash block.
  - 3. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar or rake out joint for application of sealant.
  - 4. Install temporary foam-plastic filler in head joints and remove filler when unit masonry is complete for application of sealant.

3.10 LINTELS

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

3.11 FLASHING

- A. General: Install embedded flashing in masonry at lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.
- B. Installation of flexible flashings behind veneer CMU is specified in Section 07 2713 "Modified Bituminous Sheet Air Barriers."
- C. Install flashing as follows unless otherwise indicated:
  - 1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
  - 2. At lintels, extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.
  - 3. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall and adhere flexible flashing to top of metal drip edge.
  - 4. Cut flexible flashing off flush with face of wall after masonry wall construction is completed.
- D. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.
- E. 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 or open head joints to form weep holes.
  - 2. Space weep holes 24 inches o.c. unless otherwise indicated.
- F. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in "Miscellaneous Masonry Accessories" Article.
- G. Install vents in head joints in exterior wythes at spacing indicated. Use open head joints to form vents.

1. Close cavities off vertically and horizontally with blocking in manner indicated. Install through-wall flashing and weep holes above horizontal blocking.

### 3.12 REINFORCED UNIT MASONRY INSTALLATION

- A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
  1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
  2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.
- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
  1. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
  2. Limit height of vertical grout pours to not more than 48 inches unless requirements of General Structural Notes are met.

### 3.13 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform tests and inspections. Retesting of materials that fail to meet specified requirements shall be done at Contractor's expense.
- B. Inspections: Level 1 special inspections according to the "International Building Code."
  1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
  2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
  3. Place grout only after inspectors have verified proportions of site-prepared grout.
- C. Testing Prior to Construction: One set of tests.
- D. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.

- E. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.
- F. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.
- G. Prism Test: For each type of construction provided, according to ASTM C 1314 at 7 days and at 28 days.

### 3.14 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
  - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
  - 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
  - 3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
  - 4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
  - 5. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.

### 3.15 MASONRY WASTE DISPOSAL

- A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.
- B. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.
  - 1. Crush masonry waste to less than 4 inches in each dimension.

2. Mix masonry waste with at least two parts of specified fill material for each part of masonry waste. Fill material is specified in Section 31 2000 "Earth Moving."
  3. Do not dispose of masonry waste as fill within 18 inches of finished grade.
- C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 04 2200

## SECTION 04 4300 - STONE MASONRY

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section includes the following applications of stone masonry:

1. Exterior dry-stack adhered to unit masonry backup or glass mat sheathing.
2. Dry-stack site features adhered to concrete backup.
3. Interior dry-stack adhered to glass mat sheathing.

#### 1.2 ACTION SUBMITTALS

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

1. For stone varieties proposed for use on Project, include test data indicating compliance with physical properties specified or required by referenced ASTM standards.

B. Samples for Initial Selection: For colored mortar and other items involving color selection.

C. Samples for Verification:

1. For each stone type indicated. Include at least four samples in each set for each type of stone, exhibiting extremes of the full range of color and other visual characteristics expected in completed Work. Samples will establish the standard by which stone provided will be judged.
2. For each color of mortar required. Label Samples to indicate types and amounts of pigments used.

#### 1.3 INFORMATIONAL SUBMITTALS

A. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, sources of supply, and other information as required to identify materials used. Include mix proportions for mortar and source of aggregates.

1. Submittal is for information only. Neither receipt of list nor approval of mockups constitutes approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of Architect and approved in writing.

B. Qualification Data: For qualified Installer.

#### 1.4 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs experienced stonemasons and stone fitters.
- B. Source Limitations for Stone: Obtain stone, from one quarry with resources to provide materials of consistent quality in appearance and physical properties.
- C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.
- D. Mockups: Build mockups to demonstrate aesthetic effects and set quality standards for materials and execution.
  - 1. Build mockup of typical wall area as shown on Drawings.
  - 2. Build mockups for each type of stone masonry in sizes approximately 48 inches long by 48 inches high by full thickness, including face and backup wythes and accessories.
    - a. Include metal studs, sheathing, veneer anchors, flashing, and weep holes in exterior masonry-veneer wall mockup.
  - 3. Protect accepted mockups from the elements with weather-resistant membrane.
  - 4. Approval of mockups is for color, texture, and blending of stone; relationship of mortar and sealant colors to stone colors; tooling of joints; and aesthetic qualities of workmanship.
    - a. Approval of mockups is also for other material and construction qualities Architect specifically approves in writing.
    - b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
  - 5. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- E. Preinstallation Conference: Conduct conference at Project site.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- B. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- C. 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.

- D. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

## 1.6 PROJECT CONDITIONS

- A. Protection of Stone Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed stone masonry when construction is not in progress.

- 1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.

- B. Stain Prevention: Immediately remove mortar and soil to prevent them from staining the face of stone masonry.

- 1. Protect base of walls from rain-splashed mud and mortar splatter by coverings spread on the ground and over the 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 end of each day to prevent rain from splashing mortar and dirt on completed stone 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. Remove and replace stone masonry damaged by frost or freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

- 1. 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, but not less than 7 days after completing cleaning.

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

## 1.7 COORDINATION

- A. Advise installers of other work about specific requirements for placement of reinforcement, veneer anchors, flashing, and similar items to be built into stone masonry.

## PART 2 - PRODUCTS

### 2.1 STONE

- A. River rock color range and stone type is intended to match color range of stone used at existing amphitheater at Utah State Hospital. See drawings for example of size range, style and blend.
  - 1. Match Architect's Samples for color, finish, and other stone characteristics relating to aesthetic effects.

### 2.2 MORTAR MATERIALS

- A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
  - 1. Low-Alkali Cement: Not more than 0.60 percent total alkali when tested according to ASTM C 114.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of portland cement complying with ASTM C 150, Type I or III, and hydrated lime complying with ASTM C 207.
  - 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. Essroc, Italcementi Group; Capitol PCL Blend or Saylor's Plus.
    - b. Holcim (US) Inc.; Rainbow Mortamix Custom Color Cement/Lime.
    - c. Lafarge North America; Eaglebond.
    - d. Lehigh Cement Company; Lehigh Custom Color Portland/Lime Cement.
- D. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with a record of satisfactory performance in stone masonry mortar.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Davis Colors; True Tone Mortar Colors.
    - b. Lanxess Corporation; Bayferrox Iron Oxide Pigments.
    - c. Solomon Colors; SGS Mortar Colors.
- E. Aggregate: ASTM C 144 and as follows:
  - 1. For pointing mortar, use aggregate graded with 100 percent passing No. 16 sieve.

- F. Latex Additive: Manufacturer's standard acrylic-resin or styrene-butadiene-rubber water emulsion, serving as replacement for part or all of gaging water, of type specifically recommended by latex-additive manufacturer for use with field-mixed portland cement mortar bed, and not containing a retarder.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Bonsal.
    - b. Bostik Findley Inc.
    - c. Custom Building Products.
    - d. Laticrete International, Inc.
    - e. MAPEI Corp.
- G. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Euclid Chemical Company (The); Accelguard 80.
    - b. Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Morset.
    - c. Sonneborn, Div. of Degussa Building Systems; Trimix-NCA.
- H. Water: Potable.

## 2.3 MISCELLANEOUS MASONRY ACCESSORIES

- A. Welded-Wire Lath: ASTM C 933, fabricated into 2-by-2-inch mesh with minimum 0.0625-inch- diameter, galvanized-steel wire.
- B. Lath Attachment Devices: Material and type required by ASTM C 1063 for installations indicated.

## 2.4 MASONRY CLEANERS

- A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar and grout stains, efflorescence, and other new construction stains from stone masonry surfaces without discoloring or damaging masonry surfaces; expressly approved for intended use by cleaner manufacturer and stone producer.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Diedrich Technologies, Inc.
    - b. Dominion Restoration Products.
    - c. EaCo Chem, Inc.

- d. Hydrochemical Techniques, Inc.
- e. Prosoco, Inc.

## 2.5 MORTAR 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.
  - 2. Limit cementitious materials in mortar to portland cement and lime.
  - 3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
  - 4. Mixing Pointing Mortar: Thoroughly mix cementitious and aggregate materials together before adding water. Then mix again, adding only enough water to produce a damp, unworkable mix that will retain its form when pressed into a ball. Maintain mortar in this dampened condition for one to two hours. Add remaining water in small portions until mortar reaches desired consistency. Use mortar within 30 minutes of final mixing; do not retemper or use partially hardened material.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in the 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 Stone Masonry: Comply with ASTM C 270, Proportion Specification.
  - 1. Mortar for Setting Stone: Type S.
- D. Latex-Modified Portland Cement Setting Mortar: Proportion and mix portland cement, aggregate, and latex additive to comply with latex-additive manufacturer's written instructions.
- E. Cement-Paste Bond Coat: Mix either neat cement and water or cement, sand, and water to a consistency similar to that of thick cream.
  - 1. For latex-modified portland cement setting-bed mortar, substitute latex admixture for part or all of water, according to latex-additive manufacturer's written instructions.
- F. Mortar for Scratch Coat over Metal Lath: 1 part portland cement, 1/2 part lime, 5 parts loose damp sand, and enough water to produce a workable consistency.
- G. Mortar for Scratch Coat over Unit Masonry: 1 part portland cement, 1 part lime, 7 parts loose damp sand, and enough water to produce a workable consistency.
- H. Pigmented Mortar: Use colored cement product or select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products.
  - 1. Pigments shall not exceed 10 percent of portland cement by weight.

## 2.6 FABRICATION

- A. Fabricate stone to comply with sizes, shapes, and tolerances recommended by applicable stone association or, if none, by stone source, for faces, edges, beds, and backs.
- B. Select stone to produce pieces of thickness, size, and shape indicated, including details on Drawings. Dress joints (bed and vertical) straight and at right angle to face unless otherwise indicated.
- C. Carefully inspect stone at quarry or fabrication plant for compliance with requirements for appearance, material, and fabrication. Replace defective units before shipment.
- D. Gage backs of stones for adhered veneer if more than 81 sq. in. in area.
- E. Shape stone for type of masonry (pattern) as follows:
  - 1. Coursed dry stack rubble as indicated.
- F. Finish exposed faces and edges of stone to comply with requirements indicated for finish and to match approved samples and mockups.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine surfaces indicated to receive stone masonry, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Coat concrete and unit masonry backup with asphalt dampproofing.
- B. Clean dirty or stained stone surfaces by removing soil, stains, and foreign materials before setting. Clean stone by thoroughly scrubbing with fiber brushes and then drenching with clear water. Use only mild cleaning compounds that contain no caustic or harsh materials or abrasives.

### 3.3 SETTING OF STONE MASONRY, GENERAL

- A. Arrange stones in uncoursed "drystack" rubble pattern with joint widths within tolerances indicated. Insert small stones into spaces between larger stones as needed to produce joints as uniform in width as practical.

- B. Arrange stones with color and size variations uniformly dispersed for an evenly blended appearance.
- C. Set stone to comply with requirements indicated on Drawings. Install supports, fasteners, and other attachments indicated or necessary to secure stone masonry in place. Set stone accurately in locations indicated with edges and faces aligned according to established relationships and indicated tolerances.
- D. Maintain uniform joint widths except for variations due to different stone sizes and where minor variations are required to maintain bond alignment if any. Lay walls with joints not less than 1/4 inch at narrowest points.

### 3.4 CONSTRUCTION TOLERANCES

- A. Variation in Mortar-Joint Thickness: Do not vary from joint size range indicated.
- B. Variation in Plane between Adjacent Stones: Do not exceed one-half of tolerance specified for thickness of stone.

### 3.5 INSTALLATION OF ADHERED STONE MASONRY VENEER

- A. Install flashing over sheathing and behind weather-resistant sheathing paper by fastening through sheathing into framing.
- B. Install lath over air-barrier by fastening through sheathing into framing to comply with ASTM C 1063.
- C. Install lath over unit masonry and concrete to comply with ASTM C 1063.
- D. Install scratch coat over metal lath 3/8 inch thick to comply with ASTM C 926.
- E. Coat backs of stone units and face of scratch coat with cement-paste bond coat, then butter both surfaces with setting mortar. Use sufficient setting mortar so a slight excess will be forced out the edges of stone units as they are set. Tap units into place, completely filling space between units and scratch coat.
- F. Rake out joints for pointing with mortar to depth of not less than 3/4 inch before setting mortar has hardened. Rake joints to uniform depths with square bottoms and clean sides.

### 3.6 POINTING

- A. Prepare stone-joint surfaces for pointing with mortar by removing dust and mortar particles. Where setting mortar was removed to depths greater than surrounding areas, apply pointing mortar in layers not more than 3/8 inch deep until a uniform depth is formed.

- B. Point stone joints by placing and compacting pointing mortar in layers not more than 3/8 inch deep. Compact each layer thoroughly and allow to become thumbprint hard before applying next layer.
- C. Tool joints, when pointing mortar is thumbprint hard, with a smooth jointing tool to produce the following joint profile:
  - 1. Joint Profile: Smooth, flat face recessed 1/4 inch below edges of stone (raked joint).

### 3.7 ADJUSTING AND CLEANING

- A. Remove and replace stone masonry of the following description:
  - 1. Broken, chipped, stained, or otherwise damaged stone. Stone may be repaired if methods and results are approved by Architect.
  - 2. Defective joints.
  - 3. Stone masonry not matching approved samples and mockups.
  - 4. Stone masonry not complying with other requirements indicated.
- B. Replace in a manner that results in stone masonry matching approved samples and mockups, complying with other requirements, and showing no evidence of replacement.
- C. In-Progress Cleaning: Clean stone masonry as work progresses. Remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean stone masonry as follows:
  - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
  - 2. Test cleaning methods on mockup; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before cleaning stone masonry.
  - 3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.
  - 4. Wet wall surfaces with water before applying cleaner; remove cleaner promptly by rinsing thoroughly with clear water.
  - 5. Clean stone masonry by bucket and brush hand-cleaning method described in BIA Technical Note No. 20 Revised II, using job-mixed detergent solution.

### 3.8 EXCESS MATERIALS AND WASTE

- A. Excess Stone: Stack excess stone where directed by Owner for Owner's use.
- B. Disposal as Fill Material: Dispose of clean masonry waste, including mortar and excess or soil-contaminated sand, by crushing and mixing with fill material as fill is placed.
  - 1. Do not dispose of masonry waste as fill within 18 inches of finished grade.

- C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and other waste, and legally dispose of off Owner's property.

END OF SECTION 04 4300

## SECTION 05 1200 - STRUCTURAL STEEL FRAMING

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Structural steel.
2. Prefabricated building columns.
3. Field-installed shear connectors.
4. Grout.

##### B. Related Requirements:

1. Section 05 2100 "Steel Joist Framing" for open web steel joists.
2. Section 05 3100 "Steel Decking" for field installation of shear connectors through deck.
3. Section 05 5000 "Metal Fabrications" for steel lintels and relief/ledger angles not attached to structural-steel frame, miscellaneous steel fabrications and other steel items not defined as structural steel.

#### 1.2 DEFINITIONS

- A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

#### 1.3 COORDINATION

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

#### 1.4 PREINSTALLATION MEETINGS

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

#### 1.5 ACTION SUBMITTALS

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

- B. LEED Submittals:
  - 1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
- C. Shop Drawings: Show fabrication of structural-steel components.
  - 1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
  - 2. Include embedment drawings with elevations and locations of embeds.
  - 3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
  - 4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections.
- D. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," for each welded joint whether prequalified or qualified by testing, including the following:
  - 1. Power source (constant current or constant voltage).

#### 1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For installer and fabricator.
- B. Welding certificates.
- C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.
- D. Mill test reports for structural steel, including chemical and physical properties.
- E. Product Test Reports: For the following:
  - 1. Bolts, nuts, and washers including mechanical properties and chemical analysis.
  - 2. Direct-tension indicators.
  - 3. Tension-control, high-strength, bolt-nut-washer assemblies.
  - 4. Shear stud connectors.
  - 5. Shop primers.
  - 6. Nonshrink grout.
- F. Survey of existing conditions.
- G. Source quality-control reports.
- H. Field quality-control and special inspection reports.

## 1.7 QUALITY ASSURANCE

- A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD.
- B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- C. Comply with applicable provisions of the following specifications and documents:
  - 1. AISC 303, except as noted in the General Structural Notes
  - 2. AISC 341 and AISC 341s1.
  - 3. AISC 360.
  - 4. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

## 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.
  - 1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.
- B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.
  - 1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
  - 2. Clean and relubricate bolts and nuts that become dry or rusty before use.
  - 3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F 1852 fasteners and for retesting fasteners after lubrication.

## PART 2 - PRODUCTS

### 2.1 STRUCTURAL-STEEL 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 the following:
  - 1. W-Shapes: 60 percent.
  - 2. Channels, Angles-Shapes: 60 percent.
  - 3. Plate and Bar: 25 percent.
  - 4. Cold-Formed Hollow Structural Sections: 25 percent.
  - 5. Steel Pipe: 25 percent.

6. All Other Steel Materials: 25 percent.
  - B. W-Shapes: ASTM A 992/A 992M.
  - C. Channels, Angles-Shapes: ASTM A 36/A 36M.
  - D. Plate and Bar: ASTM A 36/A 36M.
  - E. Cold-Formed Hollow Structural Sections: ASTM A 500/A 500M, Grade B, structural tubing.
  - F. Steel Pipe: ASTM A 53/A 53M, Type E or Type S, Grade B.
  - G. Welding Electrodes: Comply with AWS requirements.

## 2.2 BOLTS, CONNECTORS, AND ANCHORS

- A. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers; all with plain finish.
- B. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, heavy-hex or round head assemblies consisting of steel structural bolts with splined ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers.
  1. Finish: Plain.
- C. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.
- D. Unheaded Anchor Rods: ASTM F 1554, Grade 36 or as indicated.
  1. Configuration: as indicated.
  2. Nuts: ASTM A 563 heavy-hex carbon steel.
  3. Plate Washers: ASTM A 36/A 36M carbon steel.
  4. Washers: ASTM F 436, Type 1, hardened carbon steel.
  5. Finish: Plain or as indicated.
- E. Threaded Rods: ASTM A 36/A 36M.
  1. Nuts: ASTM A 563 heavy-hex carbon steel.
  2. Washers: ASTM F 436, Type 1, hardened carbon steel.
  3. Finish: Plain or Hot-dip zinc coating, ASTM A 153/A 153M, Class C as indicated.
- F. Clevises and Turnbuckles: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1035.
- G. Eye Bolts and Nuts: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1030.
- H. Sleeve Nuts: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1018.

### 2.3 PRIMER

- A. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.
- B. Galvanizing Repair Paint: MPI#18, MPI#19, SSPC-Paint 20, or ASTM A 780/A 780M.

### 2.4 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

### 2.5 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," and to AISC 360.
  - 1. Camber structural-steel members where indicated.
  - 2. Fabricate beams with rolling camber up.
  - 3. Identify high-strength structural steel according to ASTM A 6/A 6M and maintain markings until structural steel has been erected.
  - 4. Mark and match-mark materials for field assembly.
  - 5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.
- B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
  - 1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.
- C. Bolt Holes: Cut, drill, mechanically thermal cut, or punch standard bolt holes perpendicular to metal surfaces.
- D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.
- E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 1, "Solvent Cleaning."
- F. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.
- G. Steel Wall-Opening Framing: Select true and straight members for fabricating steel wall-opening framing to be attached to structural-steel frame. Straighten as required to provide

uniform, square, and true members in completed wall framing. Build up welded framing, weld exposed joints continuously, and grind smooth.

- H. Welded Door Frames: Build up welded door frames attached to structural-steel frame. Weld exposed joints continuously and grind smooth. Plug-weld fixed steel bar stops to frames. Secure removable stops to frames with countersunk machine screws, uniformly spaced not more than 10 inches o.c. unless otherwise indicated.
- I. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel members.
  - 1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
  - 2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
  - 3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

## 2.6 SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
  - 1. Joint Type: as indicated.
- B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
  - 1. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.

## 2.7 PAINTING

- A. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
  - 1. SSPC-SP 3, "Power Tool Cleaning."
- B. Painting: Prepare steel and apply a one-coat, nonasphaltic primer complying with SSPC-PS Guide 7.00, "Painting System Guide 7.00: Guide for Selecting One-Coat Shop Painting Systems," to provide a dry film thickness of not less than 1.5 mils.

## 2.8 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/A 123M.
  - 1. Fill vent and drain holes that are exposed in the finished Work unless they function as weep holes, by plugging with zinc solder and filing off smooth.
  - 2. Galvanize lintels, relief/ledger angles and welded door frames attached to structural-steel frame and located in exterior walls.

## 2.9 SOURCE QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform shop tests and inspections.
  - 1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
- B. Bolted Connections: Inspect and test shop-bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- C. Welded Connections: Visually inspect shop-welded connections according to AWS D1.1/D1.1M, the General Structural Notes and the following inspection procedures, at testing agency's option:
  - 1. Liquid Penetrant Inspection: ASTM E 165.
  - 2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
  - 3. Ultrasonic Inspection: ASTM E 164.
  - 4. Radiographic Inspection: ASTM E 94.
- D. In addition to visual inspection, test and inspect shop-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:
  - 1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
  - 2. Conduct tests according to requirements in AWS D1.1/D1.1M on additional shear connectors if weld fracture occurs on shear connectors already tested.
- E. Prepare test and inspection reports.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

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

#### 3.2 PREPARATION

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

#### 3.3 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.
- B. Baseplates Bearing Plates and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
  - 1. Set plates for structural members on wedges, shims, or setting nuts as required.
  - 2. Weld plate washers to top of baseplate.
  - 3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
  - 4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- C. Maintain erection tolerances of structural steel within AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

- D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that are in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
  - 1. Level and plumb individual members of structure.
  - 2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.
- E. Splice members only where indicated.
- F. Do not use thermal cutting during erection unless approved by Architect. Finish thermally cut sections within smoothness limits in AWS D1.1/D1.1M.
- G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.
- H. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

### 3.4 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
  - 1. Joint Type: as indicated.
- B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
  - 1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
  - 2. Remove backing bars or runoff tabs where indicated, back gouge, and grind steel smooth.
  - 3. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," for mill material.

### 3.5 PREFABRICATED BUILDING COLUMNS

- A. Install prefabricated building columns to comply with AISC 360, manufacturer's written recommendations, and requirements of testing and inspecting agency that apply to the fire-resistance rating indicated.

### 3.6 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
  - 1. Verify structural-steel materials and inspect steel frame joint details.
  - 2. Verify weld materials and inspect welds.
  - 3. Verify connection materials and inspect high-strength bolted connections.
- B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- C. Bolted Connections: Inspect and test bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- D. Welded Connections: Visually inspect field welds according to General Structural Notes and AWS D1.1/D1.1M.
  - 1. In addition to visual inspection, test and inspect field welds according to AWS D1.1/D1.1M 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 are not accepted.
    - c. Ultrasonic Inspection: ASTM E 164.
    - d. Radiographic Inspection: ASTM E 94.
- E. In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:
  - 1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
  - 2. Conduct tests according to requirements in AWS D1.1/D1.1M on additional shear connectors if weld fracture occurs on shear connectors already tested.

### 3.7 REPAIRS AND PROTECTION

- A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A 780/A 780M.

END OF SECTION 05 1200

## SECTION 05 1213 - ARCHITECTURALLY EXPOSED STRUCTURAL STEEL

### 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 architecturally exposed structural-steel framing.
  - 1. Requirements in Section 05 1200 "Structural Steel Framing" also apply to AESS framing.
- B. Related Sections:
  - 1. Section 01 4000 "Quality Requirements" for independent testing agency procedures and administrative requirements.
  - 2. Section 05 1200 "Structural Steel Framing" for additional requirements applicable to AESS.
  - 3. Section 05 5000 "Metal Fabrications" for steel lintels and shelf angles not attached to structural-steel frame, miscellaneous steel fabrications, and other metal items not defined as structural steel.
  - 4. Section 05 5100 "Metal Stairs."
  - 5. Section 09 9600 "High-Performance Coatings" for surface preparation and priming requirements.

#### 1.3 DEFINITIONS

- A. Architecturally Exposed Structural Steel: Structural steel designated as "architecturally exposed structural steel" or "AESS" in the Contract Documents.
- B. AESS: Structural Steel that is within 96 inches vertically and 36 inches horizontally of a walking surface and is visible to a person standing on that walking surface or is designated as "Architecturally Exposed Structural Steel" or "AESS" in the Contract Documents.

#### 1.4 ACTION SUBMITTALS

- A. Shop Drawings: Show fabrication of AESS components. Shop Drawings for structural steel may be used for AESS provided items of AESS are specifically identified and requirements below are met for AESS.
  - 1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.

2. Include embedment drawings.
3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain. Indicate grinding, finish, and profile of welds.
4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections. Indicate orientation of bolt heads.
5. Indicate exposed surfaces and edges and surface preparation being used.
6. Indicate special tolerances and erection requirements.

B. Samples: Submit samples of AESS to set quality standards for exposed welds.

1. Steel plate, 3/8 by 8 by 8 inches, with one end of a short length of rectangular steel tube, 4 by 6 by 3/8 inches, welded to plate with a continuous fillet weld and with weld ground smooth and blended.

#### 1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer and fabricator.

#### 1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category ACSE.

B. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD.

C. Mockups: Build mockups of AESS to set quality standards for fabrication and installation.

1. Build mockup of typical portion of AESS as shown on Drawings.
2. Coordinate finish painting requirements with Section 09 9600 "High-Performance Coatings".
3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

D. Preinstallation Conference: Conduct conference at Project site.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

A. Use special care in handling to prevent twisting, warping, nicking, and other damage. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.

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

## 1.8 PROJECT CONDITIONS

- A. Field Measurements: Where AESS is indicated to fit against other construction, verify actual dimensions by field measurements before fabrication.

## 1.9 COORDINATION

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

## PART 2 - PRODUCTS

### 2.1 BOLTS, CONNECTORS, AND ANCHORS

- A. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, round-head assemblies, consisting of steel structural bolts with splined ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers.
  1. Finish: Plain.

### 2.2 PRIMER

- A. Primer: Comply with Section 09 9600 "High-Performance Coatings".

### 2.3 FABRICATION

- A. Shop fabricate and assemble AESS to the maximum extent possible. Locate field joints at concealed locations if possible. Detail assemblies to minimize handling and to expedite erection.
- B. In addition to special care used to handle and fabricate AESS, comply with the following:
  1. Fabricate with exposed surfaces smooth, square, and free of surface blemishes including pitting, rust, scale, and roughness.
  2. Grind sheared, punched, and flame-cut edges of AESS to remove burrs and provide smooth surfaces and edges.
  3. Fabricate AESS with exposed surfaces free of mill marks, including rolled trade names and stamped or raised identification.
  4. Fabricate AESS with exposed surfaces free of seams to maximum extent possible.

5. Remove blemishes by filling or grinding or by welding and grinding, before cleaning, treating, and shop priming.
  6. Fabricate with piece marks fully hidden in the completed structure or made with media that permits full removal after erection.
  7. Fabricate AESS to the tolerances specified in AISC 303 for steel that is designated AESS.
  8. Seal-weld open ends of hollow structural sections with 3/8-inch closure plates for AESS.
- C. Coping, Blocking, and Joint Gaps: Maintain uniform gaps of 1/8 inch with a tolerance of 1/32 inch for AESS.
- D. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.
- E. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel framing members.
1. Cut, drill, or punch holes perpendicular to steel surfaces.
  2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
  3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

## 2.4 SHOP CONNECTIONS

- A. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work, and comply with the following:
1. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding specified tolerances.
  2. Use weld sizes, fabrication sequence, and equipment for AESS that limit distortions to allowable tolerances.
  3. Provide continuous welds of uniform size and profile where AESS is welded.
  4. Grind butt and groove welds flush to adjacent surfaces within tolerance of plus 1/16 inch, minus 0 inch for AESS.
  5. Make butt and groove welds flush to adjacent surfaces within tolerance of plus 1/16 inch, minus 0 inch for AESS. Do not grind unless required for clearances or for fitting other components, or unless directed to correct unacceptable work.
  6. Remove backing bars or runoff tabs; back-gouge and grind steel smooth for AESS.
  7. At locations where welding on the far side of an exposed connection of AESS occurs, grind distortions and marking of the steel to a smooth profile aligned with adjacent material.
  8. Make fillet welds for AESS of uniform size and profile with exposed face smooth and slightly concave. Do not grind unless directed to correct unacceptable work.

## 2.5 SHOP PRIMING

- A. Shop prime steel surfaces except the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
  2. Surfaces to be field welded.
  3. Surfaces to be high-strength bolted with slip-critical connections.
- B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
1. SSPC-SP 11, "Power Tool Cleaning to Bare Metal."
- C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
  2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Verify, with steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
1. Prepare a certified survey of bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.
- B. Examine AESS for twists, kinks, warping, gouges, and other imperfections before erecting.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep AESS secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.
1. If possible, locate welded tabs for attaching temporary bracing and safety cabling where they will be concealed from view in the completed Work.
  2. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

### 3.3 ERECTION

- A. Set AESS accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.
  - 1. Erect AESS to the tolerances specified in AISC 303 for steel that is designated AESS.
- B. Do not use thermal cutting during erection[ unless approved by Architect. Finish thermally cut sections within smoothness limits in AWS D1.1/D1.1M].

### 3.4 FIELD CONNECTIONS

- A. Weld Connections: Comply with requirements in "Weld Connections" Paragraph in "Shop Connections" Article.
  - 1. Remove backing bars or runoff tabs; back-gouge and grind steel smooth for AESS.
  - 2. Remove erection bolts in AESS, fill holes, and grind smooth.
  - 3. Fill weld access holes in AESS and grind smooth.

### 3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect AESS as specified in Division 05 Section "Structural Steel Framing." The testing agency will not be responsible for enforcing requirements relating to aesthetic effect.
- B. Architect will observe AESS in place to determine acceptability relating to aesthetic effect.

### 3.6 REPAIRS AND PROTECTION

- A. Remove welded tabs that were used for attaching temporary bracing and safety cabling and that are exposed to view in the completed Work. Grind steel smooth.
- B. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
  - 1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

END OF SECTION 05 1213

## SECTION 05 2100 - STEEL JOIST FRAMING

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. K-series steel joists.
2. K-series steel joist substitutes.
3. LH- and DLH-series long-span steel joists.
4. Joist girders.
5. Joist accessories.

##### B. Related Requirements:

1. Section 03 3000 "Cast-in-Place Concrete" for installing bearing plates in concrete.
2. Section 04 2200 "Concrete Unit Masonry" for installing bearing plates in unit masonry.
3. Section 05 1200 "Structural Steel Framing" for field-welded shear connectors.

#### 1.2 DEFINITIONS

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

#### 1.3 ACTION SUBMITTALS

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

##### B. LEED Submittals:

1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

##### C. Shop Drawings:

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

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer.
- B. Welding certificates.
- C. Manufacturer certificates.
- D. Mill Certificates: For each type of bolt.
- E. Comprehensive engineering analysis of special joists signed and sealed by the qualified professional engineer responsible for its preparation.

#### 1.5 QUALITY ASSURANCE

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

#### 1.6 DELIVERY, STORAGE, AND HANDLING

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

#### 1.7 SEQUENCING

- A. Deliver steel bearing plates to be built into cast-in-place concrete and masonry construction.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide special joists and connections capable of withstanding design loads indicated.
  - 1. Use ASD; data are given at service-load level.
  - 2. Design special joists to withstand design loads with live-load deflections no greater than the following:

a. Roof Joists: As indicated in General Structural Notes.

B. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 60 percent.

## 2.2 K-SERIES STEEL JOISTS

A. Manufacture steel joists of type indicated according to "Standard Specifications for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle top- and bottom-chord members, underslung ends, and parallel top chord.

1. Joist Type: K-series steel joists.

B. Steel Joist Substitutes: Manufacture according to "Standard Specifications for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle or -channel members.

C. Provide holes in chord members for connecting and securing other construction to joists.

D. Top-Chord Extensions: Extend top chords of joists with SJI's Type S top-chord extensions where indicated, complying with SJI's "Specifications."

E. Extended Ends: Extend bearing ends of joists with SJI's Type R extended ends where indicated, complying with SJI's "Specifications."

F. Do not camber joists.

G. Camber joists according to SJI's "Specifications."

H. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches.

## 2.3 LONG-SPAN STEEL JOISTS

A. Manufacture steel joists according to "Standard Specifications for Longspan Steel Joists, LH-Series and Deep Longspan Steel Joists, DLH-Series" in SJI's "Specifications," with steel-angle top- and bottom-chord members; of joist type and end and top-chord arrangements as indicated.

1. Joist Type: LH-series steel joists.

2. End Arrangement: Underslung.

3. Top-Chord Arrangement: As indicated.

B. Provide holes in chord members for connecting and securing other construction to joists.

C. Camber long-span steel joists according to SJI's "Specifications."

D. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches.

#### 2.4 COMPOSITE STEEL JOISTS

- A. Manufacture steel joists according to "Standard Specifications for Composite Steel Joists, CJ-Series" in SJI's "Standard Specifications for Composite Steel Joists, Weight Tables and Bridging Tables, Code of Standard Practice," with steel-angle top- and bottom-chord members and parallel top chord, and with indicated underslung or square ends.
- B. Camber composite steel joists as indicated.

#### 2.5 JOIST GIRDERS

- A. Manufacture joist girders according to "Standard Specifications for Joist Girders" in SJI's "Specifications," with steel-angle top- and bottom-chord members; with end and top-chord arrangements as indicated.
  - 1. End Arrangement: Underslung.
  - 2. Top-Chord Arrangement: as indicated.
- B. Provide holes in chord members for connecting and securing other construction to joist girders.
- C. Camber joist girders according to SJI's "Specifications."
- D. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches.

#### 2.6 PRIMERS

- A. Primer: SSPC-Paint 15, or manufacturer's standard shop primer complying with performance requirements in SSPC-Paint 15.

#### 2.7 JOIST ACCESSORIES

- A. Bridging: Provide bridging anchors and number of rows of horizontal or diagonal bridging of material, size, and type required by SJI's "Specifications" for type of joist, chord size, spacing, and span. Furnish additional erection bridging if required for stability.
- B. Bridging: Schematically indicated. Detail and fabricate according to SJI's "Specifications." Furnish additional erection bridging if required for stability.
- C. Bridging: Fabricate as indicated and according to SJI's "Specifications." Furnish additional erection bridging if required for stability.
- D. Steel bearing plates with integral anchorages are specified in Section 05 5000 "Metal Fabrications."

- E. Furnish ceiling extensions, either extended bottom-chord elements or a separate extension unit of enough strength to support ceiling construction. Extend ends to within 1/2 inch of finished wall surface unless otherwise indicated.
- F. Carbon-Steel Bolts and Threaded Fasteners: ASTM A 307, Grade A, carbon-steel, hex-head bolts and threaded fasteners; carbon-steel nuts; and flat, unhardened steel washers.
  - 1. Finish: Plain, uncoated.
- G. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy hex steel structural bolts; ASTM A 563 heavy hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers.
  - 1. Finish: Plain.
- H. Welding Electrodes: Comply with AWS standards.
- I. Furnish miscellaneous accessories including splice plates and bolts required by joist manufacturer to complete joist assembly.

## 2.8 CLEANING AND SHOP PAINTING

- A. Clean and remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories by hand-tool cleaning, SSPC-SP 2 or power-tool cleaning, SSPC-SP 3.
- B. Do not prime paint joists and accessories to receive sprayed fire-resistive materials.
- C. Apply one coat of shop primer to joists and joist accessories to be primed to provide a continuous, dry paint film not less than 1 mil thick.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

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

### 3.2 INSTALLATION

- A. Do not install joists until supporting construction is in place and secured.

- B. Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Specifications," joist manufacturer's written recommendations, and requirements in this Section.
  - 1. Before installation, splice joists delivered to Project site in more than one piece.
  - 2. Space, adjust, and align joists accurately in location before permanently fastening.
  - 3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.
  - 4. Delay rigidly connecting bottom-chord extensions to columns or supports until dead loads are applied.
- C. Field weld joists to supporting steel bearing plates and framework. Coordinate welding sequence and procedure with placement of joists. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
- D. Bolt joists to supporting steel framework using carbon-steel bolts as required.
- E. Bolt joists to supporting steel framework using high-strength structural bolts as required. Comply with Research Council on Structural Connection's "Specification for Structural Joints Using ASTM A 325 or ASTM A 490 Bolts" for high-strength structural bolt installation and tightening requirements.
- F. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.

### 3.3 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and bolted connections and to perform field tests and inspections and prepare test and inspection reports.
- B. Visually inspect bolted connections.
- C. Correct deficiencies in Work that test and inspection reports have indicated are not in compliance with specified requirements.
- D. Perform additional testing to determine compliance of corrected Work with specified requirements.

### 3.4 PROTECTION

- A. Touchup Painting: After installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists abutting structural steel, and accessories.

1. Clean and prepare surfaces by hand-tool cleaning according to SSPC-SP 2, or power-tool cleaning according to SSPC-SP 3.
  2. Apply a compatible primer of same type as primer used on adjacent surfaces.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that joists and accessories are without damage or deterioration at time of Substantial Completion.

END OF SECTION 05 2100

## SECTION 05 3100 - STEEL DECKING

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Roof deck.
2. Acoustical roof deck.
3. Composite floor deck.

##### B. Related Requirements:

1. Section 03 3000 "Cast-in-Place Concrete" for normal-weight and lightweight structural concrete fill over steel deck.
2. Section 05 1200 "Structural Steel Framing" for shop- and field-welded shear connectors.
3. Section 05 5000 "Metal Fabrications" for framing deck openings with miscellaneous steel shapes.

#### 1.2 ACTION SUBMITTALS

##### A. Product Data: For each type of deck, accessory, and product indicated.

##### B. LEED Submittals:

1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

##### C. Shop Drawings:

1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

#### 1.3 INFORMATIONAL SUBMITTALS

##### A. Welding certificates.

##### B. Product Certificates: For each type of steel deck.

##### C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that each of the following complies with requirements:

1. Power-actuated mechanical fasteners.

2. Acoustical roof deck.

D. Evaluation Reports: For steel deck.

E. Field quality-control reports.

#### 1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.3, "Structural Welding Code - Sheet Steel."

C. FM Global Listing: Provide steel roof deck evaluated by FM Global and listed in its "Approval Guide, Building Materials" for Class 1 fire rating and Class 1-90 windstorm ratings.

#### 1.5 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.

1. Protect and ventilate acoustical cellular roof deck with factory-installed insulation to maintain insulation free of moisture.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

A. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

B. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

#### 2.2 ROOF DECK

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

1. ASC Profiles, Inc.; a Blue Scope Steel company.
2. Canam United States; Canam Group Inc.

3. CMC Joist & Deck.
4. Consolidated Systems, Inc.; Metal Dek Group.
5. Cordeck.
6. DACS, Inc.
7. Epic Metals Corporation.
8. Marlyn Steel Decks, Inc.
9. New Millennium Building Systems, LLC.
10. Nucor Corp.; Vulcraft Group.
11. Roof Deck, Inc.
12. Valley Joist; Subsidiary of EBSCO Industries, Inc.
13. Verco Manufacturing Co.
14. Wheeling Corrugating Company; Div. of Wheeling-Pittsburgh Steel Corporation.

B. Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:

1. Galvanized-Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33 , G60 zinc coating.
2. Deck Profile: As indicated.
3. Profile Depth: As indicated.
4. Design Uncoated-Steel Thickness: As indicated.
5. Span Condition: As indicated.
6. Side Laps: Interlocking seam.

### 2.3 ACOUSTICAL ROOF DECK

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

1. ASC Profiles, Inc.; a Blue Scope Steel company.
2. Canam United States; Canam Group Inc.
3. CMC Joist & Deck.
4. Consolidated Systems, Inc.; Metal Dek Group.
5. Cordeck.
6. DACS, Inc.
7. Epic Metals Corporation.
8. Marlyn Steel Decks, Inc.
9. New Millennium Building Systems, LLC.
10. Nucor Corp.; Vulcraft Group.
11. Roof Deck, Inc.
12. Wheeling Corrugating Company; Div. of Wheeling-Pittsburgh Steel Corporation.

B. Acoustical Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:

1. Galvanized-Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33, G60 zinc coating.
2. Deck Profile: As indicated.
3. Design Uncoated-Steel Thickness: As indicated.
4. Span Condition: As indicated.
5. Side Laps: Interlocking seam.
6. Acoustical Perforations: Deck units with manufacturer's standard perforated vertical webs.
7. Sound-Absorbing Insulation: Manufacturer's standard premolded roll or strip of glass or mineral fiber..
  - a. Factory install sound-absorbing insulation into cells of cellular deck.
8. Acoustical Performance: NRC 0.75, tested according to ASTM C 423.

#### 2.4 COMPOSITE FLOOR DECK

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  1. ASC Profiles, Inc.; a Blue Scope Steel company.
  2. Canam United States; Canam Group Inc.
  3. CMC Joist & Deck.
  4. Consolidated Systems, Inc.; Metal Dek Group.
  5. Cordeck.
  6. DACS, Inc.
  7. Epic Metals Corporation.
  8. Marlyn Steel Decks, Inc.
  9. New Millennium Building Systems, LLC.
  10. Nucor Corp.; Vulcraft Group.
  11. Roof Deck, Inc.
  12. Verco Manufacturing Co.
  13. Wheeling Corrugating Company; Div. of Wheeling-Pittsburgh Steel Corporation.
- B. Composite Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with "SDI Specifications and Commentary for Composite Steel Floor Deck," in SDI Publication No. 31, with the minimum section properties indicated, and with the following:
  1. Prime-Painted Steel Sheet: ASTM A 1008/A 1008M, Structural Steel (SS), Grade 33 minimum, with top surface phosphatized and unpainted and underside surface shop primed with manufacturers' standard gray or white baked-on, rust-inhibitive primer.
  2. Profile Depth: 3 inches.
  3. Design Uncoated-Steel Thickness: as indicated.
  4. Span Condition: As indicated.

## 2.5 ACCESSORIES

- A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.
- B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.
- C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.
- D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.
- E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.
- F. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi, of same material and finish as deck.
- G. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck unless otherwise indicated.
- H. Piercing Hanger Tabs: Piercing steel sheet hanger attachment devices for use with floor deck.
- I. Flat Sump Plates: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck. For drains, cut holes in the field.
- J. Recessed Sump Pans: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck, with 3-inch- wide flanges and level recessed pans of 1-1/2-inch minimum depth. For drains, cut holes in the field.
- K. Galvanizing Repair Paint: ASTM A 780, SSPC-Paint 20 or MIL-P-21035B, with dry film containing a minimum of 94 percent zinc dust by weight.
- L. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

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

### 3.2 INSTALLATION, GENERAL

- A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 31, manufacturer's written instructions, and requirements in this Section.
- B. Install temporary shoring before placing deck panels if required to meet deflection limitations.
- C. Locate deck bundles to prevent overloading of supporting members.
- D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.
- E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.
- F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.
- G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.
- H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.
- I. Mechanical fasteners may be used in lieu of welding to fasten deck with written approval of Structural Engineer subject to requirements in General Structural Notes. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

### 3.3 ROOF-DECK INSTALLATION

- A. Fasten roof-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter that is not less than 1-1/2 inches long, and as follows:
  - 1. Weld Diameter: 3/4 inch, nominal.
  - 2. Weld Spacing: Weld edge and interior ribs of deck units with a minimum of two welds per deck unit at each support. Space welds as indicated.
- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of 1/2 of the span or 12 inches, and as follows:
  - 1. Fasten with a minimum of 1-1/2-inch- long welds.
- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 2 inches, with end joints as follows:
  - 1. End Joints: Lapped 4 inches minimum.

- D. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld to substrate to provide a complete deck installation.
  - 1. Weld cover plates at changes in direction of roof-deck panels unless otherwise indicated.
- E. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's written instructions to ensure complete closure.
- F. Sound-Absorbing Insulation: Installation into topside ribs of deck as specified in Section 07 5419 - Polyvinyl-Chloride (PVC) Roofing."

### 3.4 FLOOR-DECK INSTALLATION

- A. Fasten floor-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated and as follows:
  - 1. Weld Diameter: 3/4 inch, nominal.
  - 2. Weld Spacing: Space and locate welds as indicated.
- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of half of the span or as indicated, and as follows:
  - 1. Mechanically clinch or button punch as indicated.
  - 2. Fasten with a minimum of 1-1/2-inch- long welds.
- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 2 inches, with end joints as follows:
  - 1. End Joints: Lapped or butted at Contractor's option.
- D. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations unless otherwise indicated.
- E. Floor-Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of deck.

### 3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Field welds will be subject to inspection.

- C. Testing agency will report inspection results promptly and in writing to Contractor and Architect.
- D. Remove and replace work that does not comply with specified requirements.
- E. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

### 3.6 PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Repair Painting: Wire brush and clean rust spots, welds, and abraded areas on both surfaces of prime-painted deck immediately after installation, and apply repair paint.
  - 1. Apply repair paint, of same color as adjacent shop-primed deck, to bottom surfaces of deck exposed to view.
  - 2. Wire brushing, cleaning, and repair painting of bottom deck surfaces are included in Section 09 9123 "Interior Painting."
- C. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05 3100

## SECTION 05 4000 - COLD-FORMED METAL FRAMING

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Load-bearing wall framing.
2. Exterior non-load-bearing wall framing.
3. Soffit framing.

##### B. Related Requirements:

1. Section 05 5000 "Metal Fabrications" for masonry shelf/ledger angles and connections.
2. Section 09 2116 "Gypsum Board Shaft Wall Assemblies" for interior non-load-bearing, metal-stud-framed, shaft-wall assemblies.
3. Section 09 2216 "Non-Structural Metal Framing" for interior non-load-bearing, metal-stud framing and ceiling-suspension assemblies.

#### 1.2 PREINSTALLATION MEETINGS

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

#### 1.3 ACTION SUBMITTALS

- ##### A. Product Data: For each type of cold-formed steel framing product and accessory.

##### B. LEED Submittals:

1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

##### C. Shop Drawings:

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

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

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Welding certificates.
- C. Product Test Reports: For each listed product, for tests performed by manufacturer and witnessed by a qualified testing agency.
  - 1. Steel sheet.
  - 2. Expansion anchors.
  - 3. Power-actuated anchors.
  - 4. Mechanical fasteners.
  - 5. Vertical deflection clips.
  - 6. Horizontal drift deflection clips
  - 7. Miscellaneous structural clips and accessories.
- D. Research Reports: For non-standard cold-formed steel framing, from ICC-ES.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.
- B. Product Tests: Mill certificates or data from a qualified independent testing agency, or in-house testing with calibrated test equipment indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.
- C. Welding Qualifications: Qualify procedures and personnel according to the following:
  - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
  - 2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."
- D. Comply with AISI S230 "Standard for Cold-Formed Steel Framing - Prescriptive Method for One and Two Family Dwellings."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect cold-formed steel framing from corrosion, moisture staining, deformation, and other damage during delivery, storage, and handling.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

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

1. AllSteel & Gypsum Products, Inc.
2. California Expanded Metal Products Company.
3. ClarkWestern Building Systems, Inc.
4. Consolidated Fabricators Corp.; Building Products Division.
5. Craco Mfg., Inc.
6. Custom Stud Inc.
7. Design Shapes in Steel.
8. Dietrich Metal Framing; a Worthington Industries Company.
9. Formetal Co. Inc. (The).
10. MarinoWARE.
11. Nuconsteel; a Nucor Company.
12. Olmar Supply, Inc.
13. Quail Run Building Materials, Inc.
14. SCAFCO Corporation.
15. Southeastern Stud & Components, Inc.
16. State Building Products, Inc.
17. Steel Construction Systems.
18. Steel Network, Inc. (The).
19. Steel Structural Systems.
20. Steeler, Inc.
21. Super Stud Building Products, Inc.
22. Telling Industries, LLC.
23. United Metal Products, Inc.
24. United Steel Manufacturing.

### 2.2 COLD-FORMED STEEL FRAMING, GENERAL

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:

1. Grade: As required.
2. Coating: G60, A60, AZ50, or GF30.

C. Steel Sheet for Vertical Deflection Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:

1. Grade: As required by structural performance.

2. Coating: G60.

### 2.3 LOAD-BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
  1. Minimum Base-Metal Thickness: 0.0329 inch or as indicated.
  2. Flange Width: As indicated.
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges, and as follows:
  1. Minimum Base-Metal Thickness: 0.0329 inch or matching steel studs.
  2. Flange Width: 1-1/4 inches.
- C. Steel Box or Back-to-Back Headers: Manufacturer's standard C-shapes used to form header beams, of web depths indicated, unpunched, with stiffened flanges, and as follows:
  1. Minimum Base-Metal Thickness: As indicated.
  2. Flange Width: As indicated.

### 2.4 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: 0.0329 inch or as indicated.
  2. Flange Width: As indicated.
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
  1. Minimum Base-Metal Thickness: 0.0329 inch or 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 through positive mechanical attachment to stud web.
  1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. AllSteel & Gypsum Products, Inc.
    - b. ClarkWestern Building Systems, Inc.
    - c. Dietrich Metal Framing; a Worthington Industries company.

- d. MarinoWARE.
- e. SCAFCO Corporation.
- f. Steel Network, Inc. (The).
- g. Steeler, Inc.

D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:

- 1. Minimum Base-Metal Thickness: As indicated.
- 2. Flange Width: 1 inch plus the design gap for one-story structures.

E. Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.

1. Outer Track: Of web depth to allow free vertical movement of inner track, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:

- a. Minimum Base-Metal Thickness: As indicated.
- b. Flange Width: 1 inch plus the design gap for one-story structures.

2. Inner Track: Of web depth indicated, and as follows:

- a. Minimum Base-Metal Thickness: As indicated.

F. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure through positive mechanical attachment to stud web and structure.

## 2.5 SOFFIT FRAMING

A. Exterior Soffit Frame: Manufacturer's standard C-shaped steel sections, of web depths indicated, with stiffened flanges, and as follows:

- 1. Minimum Base-Metal Thickness: 0.0538 inch.
- 2. Flange Width: 1-5/8 inches, minimum.

## 2.6 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.
3. Web stiffeners.
4. Stud kickers and knee braces.
5. Hole reinforcing plates.
6. Backer plates.

## 2.7 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. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel headless, hooked bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.
- C. Expansion Anchors: Fabricated from corrosion-resistant materials, with allowable load or strength design capacities calculated according to ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing per ASTM E 488 conducted by a qualified testing agency.
- D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.
- E. 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.
- F. Welding Electrodes: Comply with AWS standards.

## 2.8 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: SSPC-Paint 20, MIL-P-21035B or ASTM A 780.
- B. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C 1107/C 1107M, with fluid consistency and 30-minute working time.
- C. Shims: Load bearing, high-density multimonomer plastic, and nonleaching; or of cold-formed steel of same grade and coating as framing members supported by shims.
- D. 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.

## 2.9 FABRICATION

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

## PART 3 - EXECUTION

### 3.1 EXAMINATION

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

### 3.2 PREPARATION

- A. Install load bearing shims or grout between the underside of load-bearing wall bottom track and the top of foundation wall or slab at locations with a gap larger than 1/4 inch to ensure a uniform bearing surface on supporting concrete or masonry construction.

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

### 3.3 INSTALLATION, GENERAL

- A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.
- B. Install cold-formed steel framing according to AISI S200 and to manufacturer's written instructions unless more stringent requirements are indicated.
- C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.
  - 1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.
- D. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.
  - 1. Cut framing members by sawing or shearing; do not torch cut.
  - 2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
    - a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
    - b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.
- E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.
- F. Install temporary bracing and supports to secure framing and support loads 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 joints with cold-formed steel framing. Independently frame both sides of joints.
- H. Install insulation, specified in Section 07 2100 "Thermal Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.
- I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.

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

### 3.4 LOAD-BEARING WALL INSTALLATION

- A. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and at spacings as follows:
  - 1. Anchor Spacing: As indicated.
- B. Squarely seat studs against top and bottom tracks with gap not exceeding of 1/8 inch between the end of wall framing member and the web of track. Fasten both flanges of studs to top and bottom tracks. Space studs as follows:
  - 1. Stud Spacing: 16 inches.
- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar configurations.
- D. Align studs vertically where floor framing interrupts wall-framing continuity. Where studs cannot be aligned, continuously reinforce track to transfer loads.
- E. Align floor and roof framing over studs according to AISI S200, Section C1. Where framing cannot be aligned, continuously reinforce track to transfer loads.
- F. Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure as indicated.
- G. Install headers over wall openings wider than stud spacing. Locate headers above openings as indicated. Fabricate headers of compound shapes indicated, complete with clip-angle connectors, web stiffeners, or gusset plates.
- H. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing.
  - 1. If type of supplementary support is not indicated, comply with stud manufacturer's written recommendations and industry standards in each case, considering weight or load resulting from item supported.
- I. Install horizontal bridging in stud system, spaced vertically 48 inches. Fasten at each stud intersection with one of the following:

1. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs with a minimum of two screws into each flange of the clip angle for framing members up to 6 inches deep.
  2. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
  3. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.
- J. Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

### 3.5 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 top and bottom track unless otherwise indicated. Space studs as follows:
1. Stud Spacing: As indicated.
- 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. Connect vertical deflection clips to bypassing studs and anchor to building structure.
- E. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.
1. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 18 inches of single deflection track. Install a combination of bridging and stud or stud-track solid blocking of width and thickness matching studs, secured to stud webs or flanges as indicated.
  2. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs as indicated with clips at each stud.
  3. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
  4. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

- F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

### 3.6 FIELD QUALITY CONTROL

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

### 3.7 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel 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 steel framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05 4000

## SECTION 05 5000 - METAL FABRICATIONS

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Steel framing and supports for operable partitions.
2. Steel framing and supports for overhead grilles.
3. Steel framing and supports for countertops.
4. Steel framing and supports for mechanical and electrical equipment.
5. Steel framing and supports for windows openings.
6. Steel framing and supports for applications where framing and supports are not specified in other Sections.
7. Shelf angles.
8. Metal ladders.
9. Miscellaneous steel trim including loading-dock edge angles.
10. Metal bollards.
11. Loose bearing and leveling plates for applications where they are not specified in other Sections.

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

1. Loose steel lintels.
2. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.

##### C. Related Requirements:

1. Section 03 3000 "Cast-in-Place Concrete" for installing anchor bolts, steel pipe sleeves, slotted-channel inserts, wedge-type inserts, and other items cast into concrete.
2. Section 04 2200 "Concrete Unit Masonry" for installing loose lintels, anchor bolts, and other items built into unit masonry.
3. Section 05 1200 "Structural Steel Framing."

#### 1.2 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of metal fabrications that are anchored to or that receive other work. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves,

concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

### 1.3 ACTION SUBMITTALS

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

1. Nonslip aggregates and nonslip-aggregate surface finishes.
2. Paint products.
3. Grout.

#### B. LEED Submittals:

1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

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

1. Steel framing and supports for operable partitions.
2. Steel framing and supports for overhead grilles.
3. Steel framing and supports for countertops.
4. Steel framing and supports for mechanical and electrical equipment.
5. Steel framing and supports at windows openings.
6. Steel framing and supports for applications where framing and supports are not specified in other Sections.
7. Shelf angles.
8. Metal ladders.
9. Miscellaneous steel trim including loading-dock edge angles.
10. Metal bollards.
11. Loose steel lintels.

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

### 1.4 INFORMATIONAL SUBMITTALS

#### A. Qualification Data: For professional engineer.

#### B. Welding certificates.

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

#### D. Research/Evaluation Reports: For post-installed anchors, from ICC-ES.

1.5 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.6 FIELD CONDITIONS

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design ladders.
- B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
  - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- C. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- D. Steel Tubing: ASTM A 500/A 500M, cold-formed steel tubing.
- E. Steel Pipe: ASTM A 53/A 53M, Standard Weight (Schedule 40) unless otherwise indicated.
- F. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.
  - 1. Size of Channels: 1-5/8 by 1-5/8 inches.
  - 2. Material: Galvanized steel, ASTM A 653/A 653M, commercial steel, Type B, with G90 coating; 0.108-inch nominal thickness.

### 2.3 FASTENERS

- A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
  - 1. Provide stainless-steel fasteners for fastening aluminum.
- 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. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.
  - 1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.
- D. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.
- E. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; 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, all hot-dip galvanized per ASTM F 2329.
- F. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.
  - 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
  - 2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.
- G. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 7/8 inches by length indicated with anchor straps or studs not less than 3 inches long at not more than 8 inches o.c. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B 633, Class Fe/Zn 5, as needed for fastening to inserts.

### 2.4 MISCELLANEOUS MATERIALS

- A. Shop Primers: Provide primers that comply with Section 09 9113 "Exterior Painting" and Section 09 9123 Interior Painting."
- B. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

- C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.
- D. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- E. Concrete: Comply with requirements in Section 03 3000 "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 3000 psi.

## 2.5 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work with accurate angles and surfaces and straight edges.
- E. Weld corners and seams continuously to comply with the following:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove welding flux immediately.
  - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.
- G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

- J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

## 2.6 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
- B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
  - 1. Fabricate units from slotted channel framing where indicated.
  - 2. Furnish inserts for units installed after concrete is placed.
- C. Fabricate supports for operable partitions from continuous steel beams of sizes indicated with attached bearing plates, anchors, and braces as indicated. Drill or punch bottom flanges of beams to receive partition track hanger rods; locate holes where indicated on operable partition Shop Drawings.
- D. Galvanize miscellaneous framing and supports at exterior walls and where subject to weather.

## 2.7 SHELF ANGLES

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

## 2.8 METAL LADDERS

- A. General:

1. Comply with ANSI A14.3.

B. Steel Ladders:

1. Space siderails 18 inches apart unless otherwise indicated.
2. Siderails: Continuous, 1/2-by-2-1/2-inch steel flat bars, with eased edges.
3. Rungs: 1-inch- diameter steel bars.
4. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
5. Provide nonslip surfaces on top of each rung by coating with abrasive material metallically bonded to rung.
  - a. Products: Subject to compliance with requirements, provide one of the following:
    - 1) Harsco Industrial IKG, a division of Harsco Corporation; Mebac.
    - 2) SlipNOT Metal Safety Flooring, a division of W. S. Molnar Company; SlipNOT.
6. Provide platforms as indicated fabricated from welded or pressure-locked steel bar grating, supported by steel angles. Limit openings in gratings to no more than 3/4 inch in least dimension.
7. Support each ladder at top and bottom and not more than 60 inches o.c. with welded or bolted steel brackets.
8. Galvanize exterior ladders, including brackets.

2.9 MISCELLANEOUS STEEL TRIM

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

2.10 METAL BOLLARDS

- A. Fabricate metal bollards from Schedule 40 steel pipe.
  1. Cap bollards with 1/4-inch- thick steel plate.
  2. Where bollards are indicated to receive controls for door operators, provide cutouts for controls and holes for wire.

- B. Fabricate bollards with 3/8-inch- thick steel baseplates for bolting to concrete slab. Drill baseplates at all four corners for 3/4-inch anchor bolts.
  - 1. Where bollards are to be anchored to sloping concrete slabs, angle baseplates for plumb alignment of bollards.
- C. Fabricate sleeves for bollard anchorage from steel pipe or tubing with 1/4-inch- thick steel plate welded to bottom of sleeve. Make sleeves not less than 8 inches deep and 3/4 inch larger than OD of bollard.
- D. Prime bollards with zinc-rich primer.

#### 2.11 LOOSE BEARING AND LEVELING PLATES

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

#### 2.12 LOOSE STEEL LINTELS

- A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.
- B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span, but not less than 8 inches unless otherwise indicated.
- C. Galvanize loose steel lintels located in exterior walls.

#### 2.13 STEEL WELD PLATES AND ANGLES

- A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

#### 2.14 FINISHES, GENERAL

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

## 2.15 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.
  - 1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
- B. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

## PART 3 - EXECUTION

### 3.1 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove welding flux immediately.
  - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.
- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

### 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.
- B. Anchor supports for operable partitions and overhead grilles securely to, and rigidly brace from, building structure.
- C. Support steel girders on solid grouted masonry, concrete, or steel pipe columns. Secure girders with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns.
  - 1. Where grout space under bearing plates is indicated for girders supported on concrete or masonry, install as specified in "Installing Bearing and Leveling Plates" Article.
- D. Install pipe columns on concrete footings with grouted baseplates. Position and grout column baseplates as specified in "Installing Bearing and Leveling Plates" Article.
  - 1. Grout baseplates of columns supporting steel girders after girders are installed and leveled.

### 3.3 INSTALLING METAL BOLLARDS

- A. Fill metal-capped bollards solidly with concrete and allow concrete to cure seven days before installing.
- B. Anchor bollards in concrete in formed or core-drilled holes not less than 8 inches deep and 3/4 inch larger than OD of bollard. Fill annular space around bollard solidly with nonshrink grout; mixed and placed to comply with grout manufacturer's written instructions. Slope grout up approximately 1/8 inch toward bollard.
- C. Anchor bollards in place with concrete footings. Center and align bollards in holes 3 inches above bottom of excavation. Place concrete and vibrate or tamp for consolidation. Support and brace bollards in position until concrete has cured.
- D. Fill bollards solidly with concrete, mounding top surface to shed water.

### 3.4 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 nonshrink grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.5 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/A 780M.

END OF SECTION 05 5000

## SECTION 05 5100 - METAL STAIRS

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Industrial-type stairs with steel grating treads.

##### B. Related Sections:

1. Section 05 5213 "Pipe and Tube Railings" for pipe and tube railings.
2. Section 06 1053 "Miscellaneous Rough Carpentry" for wood blocking for anchoring railings.
3. Section 09 2216 "Non-Structural Metal Framing" for metal backing for anchoring railings.

#### 1.2 PERFORMANCE REQUIREMENTS

- ##### A. Delegated Design: Design metal stairs, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

- ##### B. Structural Performance of Stairs: Metal stairs shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.

1. Uniform Load: 100 lbf/sq. ft..
2. Concentrated Load: 300 lbf applied on an area of 4 sq. in..
3. Uniform and concentrated loads need not be assumed to act concurrently.
4. Stair Framing: Capable of withstanding stresses resulting from railing loads in addition to loads specified above.
5. Limit deflection of treads, platforms, and framing members to L/240 or 1/4 inch, whichever is less.

- ##### C. Seismic Performance: Metal stairs shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. Component Importance Factor is 1.5.

#### 1.3 ACTION SUBMITTALS

- ##### A. Product Data: For metal stairs and the following:

1. Metal grating treads.
2. Paint products.

3. Grout.

B. LEED Submittals:

1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

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

D. Samples for Initial Selection: For products involving selection of color, texture, or design.

E. Samples for Verification: For the following products, in manufacturer's standard sizes:

1. Grating treads.

F. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

#### 1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified professional engineer.

B. Welding certificates.

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

D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for stairs.

#### 1.5 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

B. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM AMP 510, "Metal Stairs Manual," for class of stair designated, unless more stringent requirements are indicated.

1. Industrial-Type Stairs: Industrial class.

C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

## 1.6 COORDINATION

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

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

### 2.2 FERROUS METALS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- C. Steel Bars for Grating Treads: ASTM A 36/A 36M or steel strip, ASTM A 1011/A 1011M or ASTM A 1018/A 1018M.
- D. Wire Rod for Grating Crossbars: ASTM A 510.
- E. Uncoated, Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, either commercial steel, Type B, or structural steel, Grade 25, unless another grade is required by design loads; exposed.
- F. Uncoated, Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, either commercial steel, Type B, or structural steel, Grade 30, unless another grade is required by design loads.

### 2.3 FASTENERS

- A. General: Provide zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 12 for exterior use, and Class Fe/Zn 5 where built into exterior walls. Select fasteners for type, grade, and class required.
- B. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.

- C. Machine Screws: ASME B18.6.3.
- D. Lag Screws: ASME B18.2.1.
- E. Plain Washers: Round, ASME B18.22.1.
- F. Lock Washers: Helical, spring type, ASME B18.21.1.
- G. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
  - 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.

#### 2.4 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Shop Primers: Provide primers that comply with Section 09 9123 "Interior Painting."
- C. 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.

#### 2.5 FABRICATION, GENERAL

- A. Provide complete stair assemblies, including metal framing, hangers, struts, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.
  - 1. Join components by welding unless otherwise indicated.
  - 2. Use connections that maintain structural value of joined pieces.
- B. Preassembled Stairs: Assemble stairs in shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- 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 bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

- E. Form exposed work with accurate angles and surfaces and straight edges.
- F. Weld connections to comply with the following:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove welding flux immediately.
  - 4. Weld exposed corners and seams continuously unless otherwise indicated.
  - 5. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 2 welds: completely sanded joint, some undercutting and pinholes okay.
- G. 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.
- H. Fabricate joints that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

## 2.6 STEEL-FRAMED STAIRS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Alfab, Inc.
  - 2. American Stair, Inc.
  - 3. Sharon Companies Ltd. (The).
- B. Stair Framing:
  - 1. Fabricate stringers of steel plates or channels.
    - a. Provide closures for exposed ends of channel stringers.
  - 2. Construct platforms of channel headers and miscellaneous framing members as needed to comply with performance requirements.
  - 3. Weld stringers to headers; weld framing members to stringers and headers.
  - 4. Where masonry walls support metal stairs, provide temporary supporting struts designed for erecting steel stair components before installing masonry.
- C. Metal Bar-Grating Stairs: Form treads and platforms to configurations shown from metal bar grating; fabricate to comply with NAAMM MBG 531, "Metal Bar Grating Manual."
  - 1. Fabricate treads and platforms from welded steel grating with openings in gratings no more than 5/16 inch in least dimension.
  - 2. Surface: Plain.
  - 3. Finish: Shop primed.

## 2.7 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish metal stairs after assembly.
- C. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
  - 1. Interior Stairs: SSPC-SP 3, "Power Tool Cleaning."
- D. Apply shop primer to uncoated surfaces of metal stair components, except those with galvanized finishes and those to be embedded in concrete or masonry unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
  - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

## PART 3 - EXECUTION

### 3.1 INSTALLATION, GENERAL

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.
- C. Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete unless otherwise indicated.
- D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- E. Fit exposed connections accurately together to form hairline joints. 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.
- F. Field Welding: Comply with requirements for welding in "Fabrication, General" Article.

3.2 INSTALLING METAL STAIRS WITH GROUTED BASEPLATES

- A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of baseplates.
- B. Set steel stair baseplates on wedges, shims, or leveling nuts. After stairs have been positioned and aligned, 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 nonmetallic, nonshrink grout unless otherwise indicated.
  - 2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.3 ADJUSTING AND CLEANING

- A. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 09 9123 "Interior Painting."

END OF SECTION 05 5100

## SECTION 05 5213 - PIPE AND TUBE RAILINGS

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. Steel pipe and tube railings.

#### 1.2 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- C. 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.

#### 1.3 ACTION SUBMITTALS

A. Product Data: For the following:

1. Manufacturer's product lines of mechanically connected railings.
2. Railing brackets.
3. Grout, anchoring cement, and paint products.

B. LEED Submittals:

1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

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

D. Samples: 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 connecting and finishing members at intersections.

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

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.

- B. Welding certificates.

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

- D. Product Test Reports: For pipe and tube railings, for tests performed by a qualified testing agency, according to ASTM E 894 and ASTM E 935.

- E. Evaluation Reports: For post-installed anchors , from ICC-ES.

#### 1.5 QUALITY ASSURANCE

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

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

#### 1.6 DELIVERY, STORAGE, AND HANDLING

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

#### 1.7 FIELD CONDITIONS

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

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Steel Pipe and Tube Railings:

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. Wagner, R & B, Inc.

- B. Source Limitations: Obtain each type of railing from single source from single manufacturer.

## 2.2 PERFORMANCE REQUIREMENTS

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

- B. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Handrails and Top Rails of Guards:

- a. Uniform load of 50 lbf/ ft. 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. Infill of Guards:

- a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft..
- b. Infill load and other loads need not be assumed to act concurrently.

- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F, ambient; 180 deg F.

## 2.3 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

- B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.

1. Provide type of bracket with flange tapped for concealed anchorage to threaded hanger bolt and that provides 1-1/2-inch clearance from inside face of handrail to finished wall surface.

## 2.4 STEEL AND IRON

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Tubing: ASTM A 500 (cold formed) or ASTM A 513.
- 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.
- D. Plates, Shapes, and Bars: ASTM A 36/A 36M.
- E. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.

## 2.5 FASTENERS

- A. General: Provide the following:
  - 1. Ungalvanized-Steel Railings: Plated steel fasteners complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5 for zinc coating.
  - 2. Hot-Dip Galvanized Railings: Type 304 stainless-steel or hot-dip zinc-coated steel fasteners complying with ASTM A 153/A 153M or ASTM F 2329 for zinc coating.
  - 3. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.
- 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. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors capable of sustaining, without failure, a load equal to 6 times the load imposed when installed in unit masonry and 4 times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.
  - 1. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.

## 2.6 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Etching Cleaner for Galvanized Metal: Complying with MPI#25.
- C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

- D. Shop Primers: Provide primers that comply with Section 09 9113 "Exterior Painting" and Section 09 9123 "Interior Painting."
- E. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

## 2.7 FABRICATION

- A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.
- B. Shop assemble railings to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. 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 are exposed to weather in a manner that excludes 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 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. Form Changes in Direction as Follows:
  - 1. As detailed.
- J. For changes in direction made by bending, use 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.

- K. Close exposed ends of railing members with prefabricated end fittings.
- L. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.
- M. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.
  - 1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers or other means to transfer loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.
- N. 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.
- O. 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 metal plate forming bottom closure.

## 2.8 STEEL AND IRON FINISHES

- A. Galvanized Railings:
  - 1. Hot-dip galvanize exterior steel railings, including hardware, after fabrication.
  - 2. Comply with ASTM A 123/A 123M for hot-dip galvanized railings.
  - 3. Comply with ASTM A 153/A 153M for hot-dip galvanized hardware.
  - 4. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
  - 5. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.
- B. For nongalvanized-steel railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves; however, galvanize anchors to be embedded in exterior concrete or masonry.
- C. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
- D. Primer Application: Apply shop primer to prepared surfaces of railings unless otherwise indicated. Comply with requirements in SSPC-PA 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. Shop prime uncoated railings with primers specified in Section 09 9113 "Exterior Painting" and Section 09 9123 "Interior Painting" unless indicated.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

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

#### 3.2 INSTALLATION, GENERAL

- A. 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 are 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. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
  - 1. Coat, with a heavy coat of bituminous paint, concealed surfaces of aluminum that are in contact with grout, concrete, masonry, wood, or dissimilar metals.
- 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. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.

#### 3.4 ANCHORING POSTS

- A. Use metal sleeves preset and anchored into concrete for installing posts. After posts are inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.

- B. Cover anchorage joint with flange of same metal as post, welded to post after placing anchoring material.
- C. Leave anchorage joint exposed with 1/8-inch buildup, sloped away from post.
- D. 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 steel pipe railings, weld flanges to post and bolt to metal supporting surfaces.

### 3.5 ATTACHING RAILINGS

- A. Anchor railing ends at walls with round flanges anchored to wall construction and welded to railing ends.
- B. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces and welded to railing ends.
- C. Attach railings to wall with wall brackets, except where end flanges are used. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
- D. Secure wall brackets and railing end flanges 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 steel-framed partitions, use hanger or lag bolts set into wood backing between studs. Coordinate with stud installation to locate backing members.
  - 4. For steel-framed partitions, use self-tapping screws fastened to steel framing or to concealed steel reinforcements.

### 3.6 ADJUSTING AND CLEANING

- A. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 09 9113 "Exterior Painting" and Section 09 9123 "Interior Painting."
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas, and repair galvanizing to comply with ASTM A 780/A 780M.

### 3.7 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.

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Bid Documents

END OF SECTION 05 5213

## SECTION 06 1053 - MISCELLANEOUS ROUGH CARPENTRY

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Framing with dimension lumber.
2. Rooftop equipment bases and support curbs.
3. Wood blocking and nailers.
4. Plywood backing panels.

##### B. Related Requirements:

1. Section 06 1600 "Sheathing" for plywood sheathing at parapets and walls other than electrical rooms.

#### 1.2 DEFINITIONS

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

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

1. NeLMA: Northeastern Lumber Manufacturers' Association.
2. NHLA: National Hardwood Lumber Association.
3. NLGA: National Lumber Grades Authority.
4. SPIB: The Southern Pine Inspection Bureau.
5. WCLIB: West Coast Lumber Inspection Bureau.
6. WWPA: Western Wood Products Association.

#### 1.3 ACTION SUBMITTALS

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

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.

3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM 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.

B. LEED Submittals:

1. Certificates for Credit MR 7: Chain-of-custody certificates indicating that products specified to be made from certified wood comply with forest certification requirements. Include documentation that manufacturer is certified for chain of custody by an FSC-accredited certification body. Include statement indicating cost for each certified wood product.
2. Product Data for Credit IEQ 4.1: For adhesives, documentation including printed statement of VOC content.

1.4 INFORMATIONAL SUBMITTALS

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

1. Preservative-treated wood.
2. Fire-retardant-treated wood.
3. Power-driven fasteners.
4. Powder-actuated fasteners.
5. Expansion anchors.
6. Metal framing anchors.

1.5 QUALITY ASSURANCE

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

1.6 DELIVERY, STORAGE, AND HANDLING

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

## PART 2 - PRODUCTS

### 2.1 WOOD PRODUCTS, GENERAL

- A. Certified Wood: Lumber and plywood shall be produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."
- B. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
  - 1. Factory mark each piece of lumber with grade stamp of grading agency.
  - 2. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
  - 3. Provide dressed lumber, S4S, unless otherwise indicated.
- C. Maximum Moisture Content of Lumber: 15 percent for 2-inch nominal thickness or less, 19 percent for more than 2-inch nominal thickness unless otherwise indicated.

### 2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.
  - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
- D. Application: Treat items indicated on Drawings, and the following:
  - 1. Wood cants, nailers, curbs, equipment support bases, blocking, 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.
  - 3. Design Value Adjustment Factors: Treated lumber shall be tested according ASTM D 5664, and design value adjustment factors shall be calculated according to ASTM D 6841.
- C. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.
- D. Application: Treat items indicated on Drawings, and the following:
  - 1. Plywood backing panels.

#### 2.4 DIMENSION LUMBER FRAMING

- A. Other Framing: No. 2 grade and any of the following species:
  - 1. Douglas fir-larch; WCLIB or WWPA.
  - 2. Douglas fir-larch (north); NLGA.

#### 2.5 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.
  - 4. Cants.
- B. For items of dimension lumber size, provide Construction or No. 2 grade lumber and any of the following species:
  - 1. Mixed southern pine; SPIB.
  - 2. Spruce-pine-fir; NLGA.
  - 3. Western woods; WCLIB or WWPA.

4. Northern species; NLGA.
5. Eastern softwoods; NeLMA.

- C. For concealed boards, provide lumber with 15 percent maximum moisture content and any of the following species and grades:
1. Mixed southern pine, No. 2 grade; SPIB.
  2. Eastern softwoods, No. 2 Common grade; NELMA.
  3. Northern species, No. 2 Common grade; NLGA.
  4. Western woods, Construction or No. 2 Common grade; WCLIB or WWPA.
- 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, select boards with no knots capable of producing bent-over nails and damage to paneling.

## 2.6 PLYWOOD BACKING PANELS

- A. Equipment Backing Panels: DOC PS 1, Exterior, AC, fire-retardant treated, in thickness indicated or, if not indicated, not less than 1/2-inch nominal thickness.

## 2.7 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
1. Where carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners of Type 304 stainless steel.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: NES NER-272.
- D. Wood Screws: ASME B18.6.1.
- E. Lag Bolts: ASME B18.2.1.
- F. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.
1. Expansion Anchors: Anchor bolts having current ICC-ES reports meeting IBC 2009 requirements for anchors in cracked concrete

## 2.8 METAL FRAMING ANCHORS

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

- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  - 1. Cleveland Steel Specialty Co.
  - 2. KC Metals Products, Inc.
  - 3. Phoenix Metal Products, Inc.
  - 4. Simpson Strong-Tie Co., Inc.
  - 5. USP Structural Connectors.
  
- C. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 coating designation.
  - 1. Use for interior locations unless otherwise indicated.
  
- D. Hot-Dip Heavy-Galvanized Steel Sheet: ASTM A 653/A 653M; Structural Steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 coating designation; and not less than 0.036 inch thick.
  - 1. Use for wood-preserved-treated lumber and where indicated.
  
- E. Stainless-Steel Sheet: ASTM A 666, Type 304.
  - 1. Use for exterior locations and where indicated.

## 2.9 MISCELLANEOUS MATERIALS

- A. Adhesives for Gluing to Concrete or Masonry: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.
  - 1. Adhesives shall have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  
- B. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber or rubberized-asphalt compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch.

## PART 3 - EXECUTION

### 3.1 INSTALLATION, GENERAL

- A. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry to other construction; scribe and cope as needed for accurate fit. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.
  
- B. Where wood-preserved-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

- C. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- D. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant treated plywood backing panels with classification marking of testing agency exposed to view.
- E. Metal Framing Anchors: Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.
- F. Do not splice structural members between supports unless otherwise indicated.
- G. Provide blocking and framing as indicated and as required to support all facing materials, fixtures, specialty items, TV accessories, and trim.
  - 1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.
- H. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- I. Comply with AWWA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
  - 1. Use inorganic boron for items that are continuously protected from liquid water.
  - 2. Use copper naphthenate for items not continuously protected from liquid water.
- J. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
  - 1. NES NER-272 for power-driven fasteners.
  - 2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
- K. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

### 3.2 WOOD BLOCKING AND NAILER INSTALLATION

- A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

### 3.3 PROTECTION

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

END OF SECTION 06 1053

## SECTION 061323 - HEAVY TIMBER CONSTRUCTION

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes framing using timbers.

#### 1.2 DEFINITIONS

- A. Timbers: Lumber of 5 inches nominal or greater in least dimension.
- B. Inspection agencies, and the abbreviations used to reference them, include the following:
  - 1. NeLMA - Northeastern Lumber Manufacturers Association.
  - 2. NHLA - National Hardwood Lumber Association.
  - 3. NLGA - National Lumber Grades Authority.
  - 4. SPIB - Southern Pine Inspection Bureau.
  - 5. WCLIB - West Coast Lumber Inspection Bureau.
  - 6. WWPA - Western Wood Products Association.

#### 1.3 ACTION SUBMITTALS

- A. LEED Submittals:
  - 1. Certificates for Credit MR 7: Chain-of-custody certificates indicating that wood products comply with forest certification requirements. Include documentation that manufacturer is certified for chain of custody by an FSC-accredited certification body. Include statement indicating cost for each certified wood product.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Certificates of Inspection: Issued by lumber grading agency for exposed timber not marked with grade stamp.

#### 1.5 QUALITY ASSURANCE

- A. Timber Standard: Comply with AITC 108, "Standard for Heavy Timber Construction."

## PART 2 - PRODUCTS

### 2.1 TIMBER

- A. General: Comply with DOC PS 20 and with grading rules of lumber grading agencies certified by ALSC's Board of Review as applicable.
  - 1. Factory mark each item of timber with grade stamp of grading agency.
  - 2. For exposed timber indicated to receive a stained or natural finish, apply grade stamps to surfaces that will not be exposed to view, or omit grade stamps and provide certificates of grade compliance issued by grading agency.
- B. Certified Wood: Timber shall be produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."
- C. Timber Species and Grade: Douglas fir-larch or Douglas fir-larch (North); No. 1, NLGA, WCLIB, or WWPA, unless noted Select Structural.
- D. Moisture Content: Provide timber with 19 percent maximum moisture content at time of dressing.
- E. Dressing: Provide dressed timber (S4S).
- F. End Sealer: Manufacturer's standard, transparent, colorless wood sealer that is effective in retarding the transmission of moisture at cross-grain cuts and is compatible with indicated finish.
- G. Penetrating Sealer: Manufacturer's standard, transparent, penetrating wood sealer that is compatible with indicated finish.

### 2.2 TIMBER CONNECTORS

- A. General: Unless otherwise indicated, fabricate from the following materials:
  - 1. Structural-steel shapes, plates, and flat bars complying with ASTM A 36/A 36M.
  - 2. Hot-rolled steel sheet complying with ASTM A 1011/A 1011M, Structural Steel, Type SS, Grade 33.
- B. Provide bolts, 3/4 inch unless otherwise indicated, complying with ASTM A 307, Grade A; provide nuts complying with ASTM A 563; and, where indicated, provide flat washers.
- C. Finish steel assemblies and fasteners with rust-inhibitive primer, 2-mil dry film thickness.
- D. Hot-dip galvanize steel assemblies and fasteners after fabrication to comply with ASTM A 123/A 123M or ASTM A 153/A 153M.

### 2.3 FABRICATION

- A. Shop fabricate members by cutting and restoring exposed surfaces to match specified surfacing. Finish exposed surfaces to remove planing or surfacing marks, and to provide a finish equivalent to that produced by machine sanding with No. 120 grit sandpaper.
- B. Coat crosscuts with end sealer.
- C. Seal Coat: After fabricating and surfacing each unit, apply a saturation coat of penetrating sealer on surfaces of each unit except for treated wood where the treatment included a water repellent.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. General: Erect heavy timber construction true and plumb. Provide temporary bracing to maintain lines and levels until permanent supporting members are in place.
- B. Fit members by cutting and restoring exposed surfaces to match specified surfacing. Pre-drill for fasteners and assembly of units.
  - 1. Finish exposed surfaces to remove planing or surfacing marks, and to provide a finish equivalent to that produced by machine sanding with No. 120 grit sandpaper.
  - 2. Coat crosscuts with end sealer.
- C. Install timber connectors as indicated.
  - 1. Install bolts with orientation as indicated or, if not indicated, as directed by Architect.
- D. Repair damaged surfaces and finishes after completing erection. Replace damaged heavy timber construction if repairs are not approved by Architect.

END OF SECTION 06 1323

## SECTION 06 1600 - SHEATHING

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Wall sheathing.
2. Roof sheathing.
3. Sheathing joint and penetration treatment.

##### B. Related Requirements:

1. Section 06 1053 "Miscellaneous Rough Carpentry" for plywood backing panels.

#### 1.2 ACTION SUBMITTALS

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

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies 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 plywood complies with requirements. Include physical properties of treated materials.
3. For fire-retardant treatments, include physical properties of treated plywood both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5516.
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.

##### B. LEED Submittals:

1. Certificates for Credit MR 7: Chain-of-custody certificates indicating that products specified to be made from certified wood comply with forest certification requirements. Include documentation that manufacturer is certified for chain of custody by an FSC-accredited certification body. Include statement indicating cost for each certified wood product.
2. Product Data for Credit IEQ 4.1: For adhesives, documentation including printed statement of VOC content.

3. Product Data for Credit IEQ 4.4: For composite wood products, documentation indicating that product contains no urea formaldehyde.

### 1.3 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For following products, from ICC-ES:
  1. Fire-retardant-treated plywood.
  2. Foam-plastic sheathing.

### 1.4 QUALITY ASSURANCE

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

### 1.5 DELIVERY, STORAGE, AND HANDLING

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

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For assemblies with fire-resistance ratings, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
  1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory."

### 2.2 WOOD PANEL PRODUCTS

- A. Certified Wood: For the following wood products, provide materials produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship":
  1. Plywood.
- B. Plywood: Either DOC PS 1 or DOC PS 2 unless otherwise indicated.

- C. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.
- D. Factory mark panels to indicate compliance with applicable standard.

### 2.3 FIRE-RETARDANT-TREATED PLYWOOD

- 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 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. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
  - 3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.
  - 4. Design Value Adjustment Factors: Treated lumber plywood shall be tested according ASTM D 5516 and design value adjustment factors shall be calculated according to ASTM D 6305. Span ratings after treatment shall be not less than span ratings specified.
- C. Kiln-dry material after treatment to a maximum moisture content of 15 percent. Do not use material that is warped or does not comply with requirements for untreated material.
- D. Identify fire-retardant-treated plywood with appropriate classification marking of qualified testing agency.
- E. Application: Treat plywood indicated on Drawings, and the following:
  - 1. Parapet wall sheathing.
  - 2. Roof sheathing.

### 2.4 WALL SHEATHING

- A. Glass-Mat Gypsum Wall Sheathing: ASTM C 1177/1177M.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. CertainTeed Corporation; GlasRoc.
    - b. G-P Gypsum Corporation; Dens-Glass Gold.

- c. National Gypsum Company; Gold Bond e(2)XP.
  - d. Temple-Inland Inc.; GreenGlass
  - e. United States Gypsum Co.; Securock.
2. Type and Thickness: Type X, 5/8 inch thick.
  3. Size: 48 by 96 inches for vertical installation.

## 2.5 ROOF SHEATHING

- A. Plywood Roof Sheathing: Exposure 1 sheathing.

1. Span Rating: Not less than 40/20.
2. Nominal Thickness: Not less than 19/32 inch.

## 2.6 PLYWOOD FINISHED WALL PANELS

- A. Finished Wall Panels: DOC PS 1, Exterior, AC, fire-retardant treated, in thickness indicated or, if not indicated, not less than 1/2-inch nominal thickness.

## 2.7 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. For roof and wall 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 wall and roof 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 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, use screws that comply with ASTM C 1002.

## 2.8 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

- A. Sealant for Glass-Mat Gypsum Sheathing: 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 Section 079200 "Joint Sealants."
- B. Sealant for Glass-Mat Gypsum Sheathing: Silicone emulsion sealant complying with ASTM C 834, compatible with sheathing tape and sheathing and recommended by tape and sheathing manufacturers for use with glass-fiber sheathing tape and for covering exposed fasteners.
  1. Sheathing Tape: Self-adhering glass-fiber tape, minimum 2 inches wide, 10 by 10 or 10 by 20 threads/inch, of type recommended by sheathing and tape manufacturers for use with silicone emulsion sealant in sealing joints in glass-mat gypsum sheathing and with a history of successful in-service use.

## 2.9 MISCELLANEOUS MATERIALS

- A. Adhesives for Field Gluing Panels to Framing: Formulation complying with ASTM D 3498 that is approved for use with type of construction panel indicated by manufacturers of both adhesives and panels.
  1. Adhesives shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

## PART 3 - EXECUTION

### 3.1 INSTALLATION, GENERAL

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.
- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.
- C. Securely attach to substrate by fastening as indicated, complying with the following:
  1. 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 wall and roof 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. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.
- B. Fastening Methods: Fasten panels as indicated below:
  - 1. Wall and Roof Sheathing:
    - a. Screw to cold-formed metal framing.
    - b. 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.
  - 3. Install boards with a 1/4-inch gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.
- B. Apply fasteners so heads bear tightly against face of sheathing, but do not cut into facing.
- C. Horizontal Installation: Install sheathing with V-grooved edge down and tongue edge up. Interlock tongue with groove to bring long edges in contact with edges of adjacent 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. Vertical Installation: Install board vertical edges centered over studs. Abut ends and edges of each board with those of adjacent boards. Attach boards at perimeter and within field of board to each stud.
1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of 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.
- E. Seal sheathing joints according to sheathing manufacturer's written instructions.
1. Apply elastomeric sealant to joints and fasteners and trowel flat. Apply sufficient amount of sealant to completely cover joints and fasteners after troweling. Seal other penetrations and openings.
  2. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing joints and apply and trowel 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.

END OF SECTION 06 1600

## SECTION 06 4116 - PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

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

##### B. Related Requirements:

1. Section 06 1053 "Miscellaneous Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing cabinets and concealed within other construction before cabinet installation.
2. Section 12 3661 "Solid Surface Countertops" for countertops.

#### 1.2 PREINSTALLATION MEETINGS

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

#### 1.3 ACTION SUBMITTALS

- ##### A. Product Data: For each type of product, including high-pressure decorative laminate, adhesive for bonding plastic laminate, and cabinet hardware and accessories.

##### B. LEED Submittals:

1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
2. Certificates for Credit MR 7: Chain-of-custody certificates indicating that products specified to be made from certified wood comply with forest certification and chain-of-custody requirements. Include statement indicating cost for each certified wood product.
3. Product Data for Credit IEQ 4.4: For adhesives and composite wood products, documentation indicating that products contain no urea formaldehyde.

- ##### C. 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 electrical switches and outlets and other items installed in architectural plastic-laminate cabinets.
3. Apply AWI Quality Certification Program label to Shop Drawings.

D. Samples for Initial Selection:

1. Plastic laminates.
2. Thermoset decorative panels.

E. Samples for Verification:

1. Plastic laminates, 8 by 10 inches, for each type, color, pattern, and surface finish and specified edge material applied to one edge.
2. Thermoset decorative panels, 8 by 10 inches, for each color, pattern, and surface finish, with edge banding on one edge.
3. Corner pieces as follows:
  - a. Cabinet-front frame joints between stiles and rails, as well as exposed end pieces, 18 inches high by 18 inches wide by 6 inches deep.
  - b. Miter joints for standing trim.
4. Exposed cabinet hardware and accessories, one unit for each type and finish.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: For the following:
  1. Thermoset decorative panels.
  2. High-pressure decorative laminate.
  3. Adhesives.
- C. Woodwork Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.
- D. Evaluation Reports: For fire-retardant-treated materials, from ICC-ES.

#### 1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance. Shop is a certified participant in AWI's Quality Certification Program.
- B. Installer Qualifications: Certified participant in AWI's Quality Certification Program.
  1. Build mockups of typical plastic-laminate cabinets as shown on Drawings.

2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

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

#### 1.7 FIELD CONDITIONS

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

#### 1.8 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that cabinets can be supported and installed as indicated.

### PART 2 - PRODUCTS

#### 2.1 ARCHITECTURAL CABINET FABRICATORS

- A. Fabricators: Subject to compliance with requirements, provide products by one of the following:
  1. Boswell-Olsen Mill.
  2. Contempo Cabinet & Mill.
  3. Fetzer Architectural Woodwork

4. Fondell Architectural Woodwork, Inc.
5. Granite Mill & Fixture Co.
6. Huetter Mill & Cabinet Inc.

## 2.2 PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of architectural plastic-laminate cabinets indicated for construction, finishes, installation, and other requirements.
1. Provide certificates from AWI certification program indicating that woodwork, including installation, complies with requirements of grades specified.
  2. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard.
- B. Grade: Custom.
- C. Certified Wood: Plastic-laminate cabinets shall be made from wood products certified as "FSC Pure" or "FSC Mixed Credit" according to FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship," and FSC STD-40-004, "FSC Standard for Chain of Custody Certification."
- D. Type of Construction: Frameless.
- E. Cabinet, Door, and Drawer Front Interface Style: Flush overlay.
- F. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by woodwork quality standard.
1. Basis of Design Product: Provide scheduled products by **Formica Corporation and Wilsonart Laminate**, or subject to compliance with requirements, equivalent product approved by Architect prior to bid by one of the following:
    - a. Panolam Industries International, Inc.
    - b. Wilsonart International; Div. of Premark International, Inc.
      - 1) **Payne Building:**
        - a. PL-01: Wedge Strand 6306-58-Lower Cabinets
        - b. PL-02: White Microdot 949-MC-Upper Cabinets
      - 2) **Pediatric Building:** Wilsonart-See Finish Legend.
- G. Laminate Cladding for Exposed Surfaces:
1. Horizontal Surfaces: Grade HGS.
  2. Postformed Surfaces: Grade HGP.
  3. Vertical Surfaces: Grade HGS.

4. Edges: PVC edge banding, 0.12 inch thick, matching laminate in color, pattern, and finish.

H. Materials for Semiexposed Surfaces:

1. Surfaces Other Than Drawer Bodies: Thermoset decorative panels.
  - a. Edges of Thermoset Decorative Panel Shelves: PVC or polyester edge banding.
  - b. For semiexposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, NEMA LD 3, Grade VGS.
2. Drawer Sides and Backs: Thermoset decorative panels with PVC or polyester edge banding.
3. Drawer Bottoms: Thermoset decorative panels.

I. Concealed Backs of Panels with Exposed Plastic-Laminate Surfaces: High-pressure decorative laminate, NEMA LD 3, Grade BKL.

J. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.

1. Join subfronts, backs, and sides with glued rabbeted joints supplemented by mechanical fasteners or glued dovetail joints.

K. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

1. As scheduled on Finish Legend in Drawings.

## 2.3 WOOD MATERIALS

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.

## 2.4 CABINET HARDWARE AND ACCESSORIES

- A. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 180 degrees of opening, self-closing.

- B. Back-Mounted Pulls: BHMA A156.9, B02011.

1. Recessed Pulls: Provide recessed pulls for cabinets at Pediatric Facility

- C. Catches: Magnetic catches, BHMA A156.9, B03141.

- D. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081.

- E. Shelf Rests: BHMA A156.9, B04013; metal, two-pin type with shelf hold-down clip.

1. Basis of Design Standards: KV 85 Double-slot wall standard as provided by Knape and Vogt Manufacturing Company.
2. Basis of Design Brackets: KV 185 Double-flange wall bracket as provided by Knape and Vogt Manufacturing Company.
3. Color: Silver.

F. Drawer Slides: BHMA A156.9.

1. Grade 1 and Grade 2: Side mounted and extending under bottom edge of drawer; full-extension type; zinc-plated steel with polymer rollers.
2. For drawers not more than 3 inches high and not more than 24 inches wide, provide Grade 1.
3. For drawers more than 3 inches high but not more than 6 inches high and not more than 24 inches wide, provide Grade 1HD-100.
4. For drawers more than 6 inches high or more than 24 inches wide, provide Grade 1HD-200.

G. Door Locks: BHMA A156.11, E07121.

H. Drawer Locks: BHMA A156.11, E07041.

I. Door and Drawer Silencers: BHMA A156.16, L03011.

J. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.

1. Satin Chromium Plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.

K. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

## 2.5 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

C. Adhesives: Do not use adhesives that contain urea formaldehyde.

D. Adhesive for Bonding Plastic Laminate: Unpigmented contact cement, PVA or Resorcinol.

1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

## 2.6 FABRICATION

- A. Fabricate cabinets to dimensions, profiles, and details indicated.
- B. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
  - 1. Notify Architect seven days in advance of the dates and times woodwork fabrication will be complete.
  - 2. 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 before disassembling for shipment.
- C. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

## PART 3 - EXECUTION

### 3.1 PREPARATION

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

### 3.2 INSTALLATION

- A. Grade: Install cabinets to comply with same grade as item to be installed.
- B. Assemble cabinets and complete fabrication at Project site to the extent that it was not completed in the shop.
  - 1. Provide cutouts for appliances, plumbing fixtures, electrical work, and similar items.
  - 2. Seal edges of cutouts by saturating with varnish.
- C. Install cabinets level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.

- D. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- E. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing. Use fine finishing nails for exposed fastening, countersunk and filled flush with woodwork.
  - 1. Use filler matching finish of items being installed.
- F. Cabinets and Shelving: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
  - 1. Install cabinets with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
  - 2. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches o.c. with No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish.

### 3.3 ADJUSTING AND CLEANING

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

END OF SECTION 06 4116

## SECTION 06 4600 - WOOD SHELVING AND MISCELLANEOUS MILLWORK

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Closet and utility shelving.
2. Wood cubbies.
3. Clothes rods and anti-theft coat hangers.
4. Wood plank benches.
5. Wood furring, blocking, shims, and hanging strips for installing woodwork items unless concealed within other construction before woodwork installation.

##### B. Related Requirements:

1. Section 03 4800 "Precast Concrete Bench Arms" for precast concrete arms supporting wood plank benches.
2. Section 05 5000 "Metal Fabrications" for steel angles and anchors supporting wood plank benches.
3. Section 06 1053 "Miscellaneous Rough Carpentry" for wood furring, blocking, and shims required for installing wood shelves and cubbies and concealed within other construction before installation.

#### 1.2 ACTION SUBMITTALS

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

##### B. LEED Submittals:

1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
2. Product Certificates for Credit MR 5: For products and materials required to comply with requirements for regional materials, certificates indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating distance to Project, cost for each regional material, and fraction by weight that is considered regional.
3. Certificates for Credit MR 7: Chain-of-custody certificates indicating that products specified to be made from certified wood comply with forest certification and chain-of-custody requirements. Include statement indicating cost for each certified wood product.
4. Product Data for Credit IEQ 4.1: For installation adhesives, including printed statement of VOC content.

5. Product Data for Credit IEQ 4.4: For adhesives and composite wood products, documentation indicating that products contain no urea formaldehyde.
- C. 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. Apply AWI Quality Certification Program label to Shop Drawings.
- D. Samples for Initial Selection:
1. PVC edge material.
  2. Thermoset decorative panels.
  3. Shop-applied transparent finishes.
- E. Samples for Verification:
1. Lumber for transparent finish, not less than 5 inches wide by 12 inches long, for each species and cut, finished on one side and one edge.
  2. Lumber and panel products with shop-applied opaque finish, 5 inches wide by 12 inches long for lumber and 8 by 10 inches for panels, for each finish system and color, with exposed surface finished.

### 1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: For the following:
1. Thermoset decorative panels.
  2. Adhesives.
- C. Woodwork Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.
- D. Evaluation Reports: For fire-retardant-treated materials, from ICC-ES.

### 1.4 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance. Shop is a certified participant in AWI's Quality Certification Program.
- B. Installer Qualifications: Certified participant in AWI's Quality Certification Program.

- C. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.
- D. 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 of typical wood shelves and cubbies as shown on Drawings.
  - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver wood shelves and cubbies and wood blank benches until operations that could damage wood items have been completed in installation areas. If wood shelves and cubbies must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

#### 1.6 FIELD CONDITIONS

- A. Environmental Limitations for Interior Work: Do not deliver or install interior wood shelves and cubbies 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.

#### 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 wood shelves and cubbies can be supported and installed as indicated.

### PART 2 - PRODUCTS

#### 2.1 WOOD SHELVING AND MISCELLANEOUS MILLWORK FABRICATORS

- A. Fabricators: Subject to compliance with requirements, provide products by one of the following:
  - 1. Anderson Mill, Inc.
  - 2. Boswell-Olsen Mill.
  - 3. Contempo Cabinet & Mill.
  - 4. Fetzer Architectural Woodwork
  - 5. Fondell Architectural Woodwork, Inc.

6. Granite Mill & Fixture Co.
7. Huetter Mill & Cabinet Inc.

## 2.2 WOOD SHELVING AND MISCELLANEOUS MILLWORK, GENERAL

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of wood shelves and cubbies indicated for construction, finishes, installation, and other requirements.
  1. Provide certificates from AWI certification program indicating that woodwork, including installation, complies with requirements of grades specified.
  2. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard.
- B. Wood Bench Planks for Transparent Finish: IPÊ or teak, plain sawn.

## 2.3 WOOD BENCH PLANKS

- A. Wood Bench Planks: Provide wood plank material hand-selected for uniformity of appearance and freedom from characteristics, on exposed surfaces and edges, that would impair finish appearance, including decay, honeycomb, knot-holes, shake, splits, torn grain, and wane.
  1. Wood Bench Plank Species and Grade: Solid ip• or teak, plain sawn planks, as selected by Architect.
  2. Dimensions: 11 1/2-inch wide by 3-inch deep boards, actual dimensions. Length as indicated.
  3. Colors: as selected by Architect.
  4. Fasteners: Use metals in contact with wood that comply with wood manufacturer's recommendations. Also see structural details.

## 2.4 CLOSET AND UTILITY SHELVING

- A. Grade: Custom.
- B. Shelf Material: 3/4-inch thermoset decorative panel with PVC T-mold edge.
- C. Closet Rods: 1-5/16-inch- diameter, color-coated-steel tubes complying with BHMA A156.16, L03131.
- D. Theft-Proof Coat Hangers: Provide coat hangers with looped eye that prevents removal of hanger from coat rod without removing coat rod.

## 2.5 WOOD MATERIALS

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of wood shelves and cubbies and quality grade specified unless otherwise indicated.
  - 1. Wood Moisture Content: 5 to 10 percent.
- B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of wood shelves and cubbies and quality grade specified unless otherwise indicated.
  - 1. Recycled Content of Medium-Density Fiberboard and Particleboard: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 20 percent.
  - 2. Thermoset Decorative Panels: Particleboard finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD 3, Grade VGL, for test methods 3.3, 3.4, 3.6, 3.8, and 3.10.
- C. Wood Species for Transparent Finish:
  - 1. Wood Bench Planks: IPÊ (Brazilian walnut) or Teak.

## 2.6 HARDWARE AND ACCESSORIES

- A. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081.
- B. Shelf Brackets with Rod Support: BHMA A156.16, B04051; prime-painted formed steel.

## 2.7 MISCELLANEOUS MATERIALS

- A. Interior Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.
- B. Provide self-drilling screws for metal-framing supports, as recommended by metal-framing manufacturer.
- C. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.
- D. Adhesives: Do not use adhesives that contain urea formaldehyde.
- E. VOC Limits for Installation Adhesives and Sealants: Use products 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. Multipurpose Construction Adhesives: 70 g/L.
3. Structural Wood Member Adhesive: 140 g/L.
4. Architectural Sealants: 250 g/L.

## 2.8 FABRICATION

- A. Fabricate wood shelves and cubbies to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:
  1. Edges of Solid-Wood (Lumber) Members: 1/16 inch unless otherwise indicated.
  2. Edges of Rails and Similar Members More Than 3/4 Inch Thick: 1/8 inch.
- B. Backout or groove backs of flat trim members and kerf backs of other wide, flat members except for members with ends exposed in finished work.
- C. Cut wood bench planks to accurately fit precast bench arms.

## 2.9 SHOP FINISHING OF WOOD BENCH PLANKS

- A. General: Finish wood bench planks at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.
- B. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural woodwork, as applicable to each unit of work.
  1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of woodwork.
- C. Transparent Finish:
  1. Grade: Same as item to be finished.
  2. Finish: System - 5, conversion varnish.
  3. Staining: Match approved sample for color.
  4. Open Finish for Open-Grain Woods: Do not apply filler to open-grain woods.
  5. Sheen: Satin, 31-45 gloss units measured on 60-degree gloss meter per ASTM D 523.

## PART 3 - EXECUTION

### 3.1 PREPARATION

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

### 3.2 INSTALLATION

- A. Grade: Install wood shelves, cubbies and wood bench planks to comply with same grade as item to be installed.
- B. Assemble wood shelves, cubbies and wood bench planks and complete fabrication at Project site to the extent that it was not completed in the shop.
- C. Install wood shelves, cubbies and wood bench planks level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.
- D. Install shelf brackets according to manufacturer's written instructions, spaced not more than 32 inches o.c. Fasten to framing members, blocking, or metal backing, or use toggle bolts or hollow wall anchors.
- E. Cut shelves to neatly fit openings with only enough gap to allow shelves to be removed and reinstalled. Install shelves, fully seated on cleats, brackets, and supports.
  - 1. Fasten shelves to brackets to comply with bracket manufacturer's written instructions.
- F. Scribe and cut wood shelves, cubbies and wood bench planks to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- G. Anchor wood shelves, cubbies and wood bench planks to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing. Use fine finishing nails for exposed fastening, countersunk and filled flush with woodwork.
  - 1. For shop-finished items, use filler matching finish of items being installed.

### 3.3 ADJUSTING AND CLEANING

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

END OF SECTION 06 4600

## SECTION 06 6400 – TRANSLUCENT PLASTIC 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. Translucent plastic panels at ceiling.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include plans, elevations, sections, panel dimensions, details, and attachments to other work.
- C. Samples for Initial Selection:
  - 1. Submit minimum 2-inch by 2-inch samples. Indicate full color, texture and pattern variation.
- D. Samples for Verification:
  - 1. Submit minimum 4-inch by 4-inch sample for each type, texture, pattern and color of solid plastic fabrication.

#### 1.4 INFORMATION SUBMITTALS

- A. Test Reports: Product test reports from a qualified independent third-party testing agency.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: Submit manufacturer's care and maintenance data, including care, repair and cleaning instructions.

## 1.6 QUALITY ASSURANCE

- A. Testing Agency: Acceptable to authorities having jurisdiction.
- B. Test each type and class of panel system for compliance with project performance requirements, based on comprehensive testing of current products. Previously completed test reports will be acceptable if for current manufacturer and indicative of products used on this project. Include the following:
  - 1. Rate of Burning (ASTM D 635)
  - 2. Self-Ignition Temperature (ASTM D 1929)
  - 3. Density of Smoke (ASTM D 2843)
  - 4. Flame spread and Smoke developed testing (ASTM E 84)
  - 5. Room Corner Burn Test (NFPA 286)
  - 6. Extent of Burning (UL 94)
  - 7. Impact strength (ASTM D 3763)
  - 8. Safety glazing impact resistance (ANSI Z97.1-2004)
  - 9. UPITT Test for Combustion Product Toxicity
  - 10. Dynamic environmental testing (ASTM standards D 5116 and D 6670)
- C. Manufacturers Qualifications:
  - 1. Company continuously employed in the manufacture of specified materials for a period of at least five years and which can show evidence of those materials being satisfactorily used on at least five projects of similar size, scope and location.
  - 2. Use manufacturer that can offer a documented reclaim process that will take back, at the manufacturers cost, panels that are at their end-of life cycle.
- D. Manufacture panels that are produced from a minimum of 40 percent post-industrial recycle content.

## 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver Plastic Fabrications, systems and specified items in manufacturer's standard protective packaging.
- B. Do not deliver Plastic Fabrications, system, components and accessories to Project site until areas are ready for installation.
- C. Store materials in a flat orientation in a dry place that is not exposed to exterior elements.
- D. Handle materials to prevent damage to finished surfaces. Provide protective coverings to prevent damage or staining following installation for duration of project.
- E. Before installing Plastic Fabrications, permit them to reach room temperature.

## 1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install plastic paneling until spaces are enclosed and weathertight and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Source Limitations: Obtain plastic panels from single manufacturer.

### 2.2 TRANSLUCENT PLASTIC SHEET CEILING PANELS

- A. Engineered Polyester Resin Plastic Paneling: Solid paneling made from polyester resin with flame retardant and integral color.
  - 1. Product: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Varia™, ecoresin™ sheet as provided by 3form, Inc. Flock Cotton with a sandstone finish on front and back.
  - 2. Sheet Size: Maximum 4 feet by 10 feet.
  - 3. Thickness: Minimum 3/8 inch.
  - 4. Interlayer Materials: Compatible with polyesters and bonding process to create a monolithic sheet of material when complete.
  - 5. Minimum Performance Attributes:
    - a. Surface-Burning Characteristics: As follows when tested by a qualified testing agency according to ASTM E 84. Identify products with appropriate markings of applicable testing agency.
      - 1) Flame-Spread Index: 25 or less.
      - 2) Smoke-Developed Index: 450 or less at thickness of 1 inch.
    - b. Rate of Burning (ASTM D 635). Material must attain CC1 Rating for a nominal thickness of 0.060 inch and greater.
    - c. Self-Ignition Temperature (ASTM D 1929). Material must have a Self-ignition temperature greater than 650 deg. F.
    - d. Room Corner Burn Test (NFPA 286). Material must meet Class A criteria at 1/4 inch thickness as described by the 2003 International Building Code.
    - e. Extent of Burning (UL 94). Must submit UL card.
    - f. Impact strength. Minimum impact strength test as measured by ASTM D 3763 of 20 ft. lbs. (For durability, shipping, installation, and use).

- g. Safety Glazing. Material must attain a Class A impact rating in accordance with ANSI Z97.1-2004 at 1/8-inch thickness.
  - h. UPITT Test for Combustion Product Toxicity: Product must be recorded as “not more toxic than wood”.
6. Color: As selected by Architect from manufacturer's full range.

### 2.3 ACCESSORIES

- A. General: Provide products of material, size, and shape required for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaner: Type recommended by manufacturer.
- C. Fasteners: Use screws designed specifically for plastics. Self-threading screws are acceptable for permanent installations. Provide threaded metal inserts for applications requiring frequent disassembly such as light fixtures.
- D. Bonding Cements: May be achieved with solvents or adhesives, suitable for use with product and application.

### 2.4 FABRICATION

- A. General: Fabricate Plastic Fabrications to designs, sizes and thicknesses indicated and to comply with indicated standards. Sizes, profiles and other characteristics are indicated on the drawings.
- B. Comply with manufacturer's written recommendations for fabrication.
- C. Machining: Acceptable means of machining are listed below. Ensure that material is not chipped or warped by machining operations.
  - 1. Sawing: Select equipment and blades suitable for type of cut required.
  - 2. Drilling: Drills specifically designed for use with plastic products.
  - 3. Milling: Climb cut where possible.
  - 4. Routing
  - 5. Tapping
- D. Forming: Form products to shapes indicated using the appropriate method listed below. Comply with manufacturer's written instructions.
  - 1. Cold Bending
  - 2. Hot Bending
  - 3. Thermoforming: Acceptable only on uncoated material.
  - 4. Drape Forming
  - 5. Matched Mold Forming
  - 6. Mechanical Forming

- E. Laminating: Laminate to substrates indicated using adhesives and techniques recommended by manufacturer.

### 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 adhesive bond, including oil, grease, dirt, and dust.
- B. Condition panels by unpacking and placing in installation space before installation according to manufacturer's written recommendations.

#### 3.3 INSTALLATION

- A. Install plastic paneling according to manufacturer's written instructions.
- B. Manufacturer's shop to fabricate items to the greatest degree possible.
- C. Utilize fasteners, adhesives and bonding agents recommended by manufacturer for type of installation indicated. Material that is chipped, warped, hazed or discolored as a result of installation or fabrication methods will be rejected.
- D. Install components plumb, level and rigid, scribed to adjacent finishes, in accordance with approved shop drawings and product data.
- E. Form field joints using manufacturer's recommended procedures. Locate seams in panels so that they are not directly in line with seams in substrates.

#### 3.4 CLEANING AND PROTECTION

- A. Protect surfaces from damage until date of substantial completion. Repair work or replace damaged work, which cannot be repaired to Architect's satisfaction.

END OF SECTION 06 6400

## SECTION 07 1326 - SELF-ADHERING SHEET WATERPROOFING

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Modified bituminous sheet waterproofing.
2. Bonded polyethylene sheet for underslab horizontal applications.
3. Foundation drainage insulation.

##### B. Related Requirements:

1. Section 07 9500 "Expansion Control" for foundation-wall expansion-joint assemblies that interface with waterproofing.

#### 1.2 PREINSTALLATION MEETINGS

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

1. Review waterproofing requirements including surface preparation, substrate condition and pretreatment, minimum curing period, forecasted weather conditions, special details and sheet flashings, installation procedures, testing and inspection procedures, and protection and repairs.

#### 1.3 ACTION SUBMITTALS

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

1. Include construction details, material descriptions, and tested physical and performance properties of waterproofing.
2. Include manufacturer's written instructions for evaluating, preparing, and treating substrate.

##### B. LEED Submittals:

1. Product Certificates for Credit MR 5: For products and materials required to comply with requirements for regional materials, certificates indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating distance to Project, cost for each regional material, and fraction by weight that is considered regional.

- C. Shop Drawings: Show locations and extent of waterproofing and details of substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, and other termination conditions.
  - 1. Include setting drawings showing layout, sizes, sections, profiles, and joint details of pedestal-supported concrete pavers.
- D. Samples: For each exposed product and for each color and texture specified, including the following products:
  - 1. 8-by-8-inch square of each waterproofing and flashing sheet.
  - 2. 8-by-8-inch square of insulation.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Field quality-control reports.
- C. Sample Warranties: For special warranties.

#### 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by waterproofing manufacturer.
- B. Mockups: Before beginning installation, install waterproofing to 100 sq. ft of wall to demonstrate surface preparation, crack and joint treatment, corner treatment, and execution quality.
  - 1. If Architect determines mockups do not comply with requirements, reapply waterproofing and reinstall overlying construction until mockups are approved.
  - 2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- C. Manufacturer's Representative: Arrange to have trained representative of the manufacturer on site periodically to review installation procedures.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver liquid materials to Project site in original packages with seals unbroken, labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storing and mixing with other components.
- B. Store liquid materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by waterproofing manufacturer.

- C. Remove and replace liquid materials that cannot be applied within their stated shelf life.
- D. Store rolls according to manufacturer's written instructions.
- E. Protect stored materials from direct sunlight.

#### 1.7 FIELD CONDITIONS

- A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate.
  - 1. Do not apply waterproofing in snow, rain, fog, or mist.
- B. Maintain adequate ventilation during preparation and application of waterproofing materials.

#### 1.8 WARRANTY

- A. Special Manufacturer's Warranty: Manufacturer's standard form in which manufacturer agrees to replace waterproofing material that does not comply with requirements or that fails to remain watertight within specified warranty period.
  - 1. Warranty does not include failure of waterproofing due to failure of substrate prepared and treated according to requirements or formation of new joints and cracks in substrate exceeding 1/16 inch in width.
  - 2. Warranty Period: Five years from date of Substantial Completion.

### PART 2 - PRODUCTS

#### 2.1 MATERIALS, GENERAL

- A. Source Limitations for Waterproofing System: Obtain waterproofing materials and molded-sheet drainage panels from single source from single manufacturer.

#### 2.2 MODIFIED BITUMINOUS SHEET WATERPROOFING

- A. Modified Bituminous Sheet: Minimum 60-mil nominal thickness, self-adhering sheet consisting of 56 mils of rubberized asphalt laminated on one side to a 4-mil- thick, polyethylene-film reinforcement, and with release liner on adhesive side; formulated for application with primer or surface conditioner that complies with VOC limits of authorities having jurisdiction.
  - 1. Basis of Design Product: Subject to compliance with requirements, provide **Polyguard 650** as provided by **Polyguard Products** or equivalent waterproofing system complying

with requirements, approved by Architect in writing prior to bid, from one of the following manufacturers:

- a. American Hydrotech, Inc; VM75.
  - b. Carlisle Coatings & Waterproofing Inc; CCW MiraDRI 860/861.
  - c. CETCO Building Materials Group, a subsidiary of AMCOL International Corp; Envirosheet.
  - d. Grace Construction Products; W.R. Grace & Co. -- Conn; Bituthene 4000.
  - e. Henry Company; Blueskin WP 100/200.
  - f. Meadows, W.R.,Inc; SealTight Mel-Rol.
  - g. Protecto Wrap Company; PW 100/60.
2. Physical Properties:
- a. Tensile Strength, Membrane: 250 psi minimum; ASTM D 412, Die C, modified.
  - b. Ultimate Elongation: 300 percent minimum; ASTM D 412, Die C, modified.
  - c. Low-Temperature Flexibility: Pass at minus 20 deg F; ASTM D 1970.
  - d. Crack Cycling: Unaffected after 100 cycles of 1/8-inch movement; ASTM C 836.
  - e. Puncture Resistance: 40 lbf minimum; ASTM E 154.
  - f. Water Absorption: 0.2 percent weight-gain maximum after 48-hour immersion at 70 deg F; ASTM D 570.
  - g. Water Vapor Permeance: 0.05 perms maximum; ASTM E 96/E 96M, Water Method.
  - h. Hydrostatic-Head Resistance: 200 feet minimum; ASTM D 5385.
3. Sheet Strips: Self-adhering, rubberized-asphalt strips of same material and thickness as sheet waterproofing.

### 2.3 BELOW SLAB SHEET WATERPROOFING

- A. Bonded HDPE or Polyethylene Sheet for Blindsight Horizontal Applications: Uniform, flexible, multilayered-composite sheet membrane consisting of either an HDPE film coated with pressure-sensitive adhesive and protective release liner, total 46-mil thickness, or a cross-laminated film of low- and medium-density polyethylene, coated with a modified asphalt layer and a nonwoven geotextile-fabric final layer, total 95-mil thickness; with the following physical properties:
1. Basis of Design Product: Subject to compliance with requirements, provide **Underseal Underslab Membrane** as provided by **Polyguard Products** or equivalent waterproofing system complying with requirements, approved by Architect in writing prior to bid, from one of the following manufacturers:
    - a. Grace Construction Products; W.R. Grace & Co. -- Conn; Preprufe 300R.
  2. Tensile Strength, Film: 2000 psi minimum; ASTM D 412.
  3. Low-Temperature Flexibility: Pass at minus 10 deg F; ASTM D 1970.
  4. Peel Adhesion to Concrete: 5 lbf/in. minimum; ASTM D 903, modified.
  5. Lap Adhesion: 2.5 lbf/in. minimum; ASTM D 1876, modified.

6. Hydrostatic-Head Resistance: 231 feet; ASTM D 5385, modified.
7. Puncture Resistance: 200 lbf minimum; ASTM E 154.
8. Water Vapor Permeance: 0.01 perms maximum; ASTM E 96/E 96M, Water Method.
9. Water Absorption: 0.5 percent maximum; ASTM D 570.

#### 2.4 AUXILIARY MATERIALS

- A. General: Furnish auxiliary materials recommended by waterproofing manufacturer for intended use and compatible with sheet waterproofing.
- B. Primer: Liquid solvent-borne primer recommended for substrate by sheet-waterproofing material manufacturer.
- C. Surface Conditioner: Liquid, waterborne surface conditioner recommended for substrate by sheet-waterproofing material manufacturer.
- D. Liquid Membrane: Elastomeric, two-component liquid, cold fluid applied, of trowel grade or low viscosity.
- E. Substrate Patching Membrane: Low-viscosity, two-component, modified asphalt coating.
- F. Sheet Strips: Self-adhering, rubberized-asphalt sheet strips of same material and thickness as sheet waterproofing.
- G. Mastic, Adhesives, and Tape: Liquid mastic and adhesives, and adhesive tapes recommended by waterproofing manufacturer.
  1. Detail Tape: Two-sided, pressure-sensitive, self-adhering reinforced tape, 4-1/2 inches wide, with a tack-free protective adhesive coating on one side and release film on self-adhering side.
  2. Detail Strips: 62.5-mil- thick, felt-reinforced self-adhesive strip, 9 inches wide, with release film on adhesive side.
- H. Metal Termination Bars: Aluminum bars, approximately 1 by 1/8 inch thick, predrilled at 9-inch centers.

#### 2.5 INSULATION DRAINAGE PANELS

- A. Geotextile-Faced, Wall-Insulation Drainage Panels: Extruded-polystyrene board insulation complying with ASTM C 578, Type IV, 25-psi minimum compressive strength; fabricated with tongue-and-groove edges and with one side having grooved drainage channels faced with nonwoven geotextile filter fabric.
  1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Owens Corning Insulating Systems LLC; Insul-Drain.
    - b. T. Clear Corporation, a subsidiary of Fin Pan Inc; Thermadry 750.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the waterproofing.
  - 1. Verify that concrete has cured and aged for minimum time period recommended in writing by waterproofing manufacturer.
  - 2. Verify that substrate is visibly dry and within the moisture limits recommended in writing by manufacturer. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
  - 3. Verify that concrete is dry, smooth, and sound; and ready to receive waterproofing membrane.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 SURFACE PREPARATION

- A. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for waterproofing application.
- B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction.
- C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, 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.
- E. 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 sheet strips of width according to manufacturer's written instructions and center over treated construction and contraction joints and cracks exceeding a width of 1/16 inch.
- F. Bridge and cover isolation joints or expansion joints and discontinuous deck-to-wall and deck-to-deck joints with overlapping sheet strips.
  - 1. Invert and loosely lay first sheet strip over center of joint. Firmly adhere second sheet strip to first and overlap to substrate.
- G. Corners: Prepare, prime, and treat inside and outside corners according to ASTM D 6135.

1. Install membrane strips centered over vertical inside corners. Install 3/4-inch fillets of liquid membrane on horizontal inside corners and as follows:
  - a. At footing-to-wall intersections, extend liquid membrane in each direction from corner or install membrane strip centered over corner.
- H. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through waterproofing and at drains and protrusions according to ASTM D 6135.

### 3.3 MODIFIED BITUMINOUS SHEET-WATERPROOFING APPLICATION

- A. Install modified bituminous sheets according to waterproofing manufacturer's written instructions and recommendations in ASTM D 6135.
- B. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by sheet waterproofing in same day. Reprime areas exposed for more than 24 hours.
- C. Apply and firmly adhere sheets over area to receive waterproofing. Accurately align sheets and maintain uniform 2-1/2-inch- minimum lap widths and end laps. Overlap and seal seams, and stagger end laps to ensure watertight installation.
  1. When ambient and substrate temperatures range between 25 and 40 deg F, install self-adhering, modified bituminous sheets produced for low-temperature application. Do not use low-temperature sheets if ambient or substrate temperature is higher than 60 deg F.
- D. Two-Ply Application: Install sheets to form a membrane with lap widths not less than 50 percent of sheet widths to provide a minimum of 2 thicknesses of sheet membrane over areas to receive waterproofing.
- E. Horizontal Application: Apply sheets from low point to high point of decks to ensure that side laps shed water.
- F. Apply continuous sheets over already-installed sheet strips, bridging substrate cracks, construction, and contraction joints.
- G. Seal edges of sheet-waterproofing terminations with mastic.
- H. Install sheet-waterproofing and auxiliary materials to tie into adjacent waterproofing.
- I. Repair tears, voids, and lapped seams in waterproofing not complying with requirements. Slit and flatten fishmouths and blisters. Patch with sheet waterproofing extending 6 inches beyond repaired areas in all directions.
- J. Immediately install protection course with butted joints over waterproofing membrane.
- K. Correct deficiencies in or remove sheet waterproofing that does not comply with requirements; repair substrates, reapply waterproofing, and repair sheet flashings.

### 3.4 BELOW-SLAB SHEET-WATERPROOFING APPLICATION

- A. Install bonded blindside sheet waterproofing according to manufacturer's written instructions.
- B. Place and secure molded-sheet drainage panels over substrate. Lap edges and ends of geotextile to maintain continuity.
- C. Horizontal Applications: Install sheet with face against substrate. Accurately align sheets and maintain uniform side and end laps of minimum dimensions required by membrane manufacturer. Overlap and seal seams, and stagger and tape end laps to ensure watertight installation.
- D. Corners: Seal lapped terminations and cut edges of sheet waterproofing at inside and outside corners with detail tape.
- E. Seal penetrations through sheet waterproofing to provide watertight seal with detail tape patches or wraps and a liquid-membrane troweling.
- F. Install sheet-waterproofing and auxiliary materials to produce a continuous watertight tie into adjacent waterproofing.
- G. Repair tears, voids, and lapped seams in waterproofing not complying with requirements. Tape perimeter of damaged or nonconforming area extending 6 inches beyond repaired areas in all directions. Apply a patch of sheet waterproofing and firmly secure with detail tape.

### 3.5 MOLDED-SHEET DRAINAGE-PANEL INSTALLATION

- A. Place and secure molded-sheet drainage panels, with geotextile facing away from wall or deck substrate, according to manufacturer's written instructions. Use adhesives or other methods that do not penetrate waterproofing. Lap edges and ends of geotextile to maintain continuity. Protect installed molded-sheet drainage panels during subsequent construction.

### 3.6 FIELD QUALITY CONTROL

- A. Engage a site representative qualified by waterproofing membrane manufacturer to inspect substrate conditions, surface preparation, membrane application, flashings, protection, and drainage components, and to furnish daily reports to Architect.
- B. Prepare inspection reports.

### 3.7 PROTECTION, REPAIR, AND CLEANING

- A. Protect waterproofing from damage and wear during remainder of construction period.
- B. Protect installed board insulation from damage due to UV light, harmful weather exposures, physical abuse, and other causes. Provide temporary coverings where insulation is subject to

abuse and cannot be concealed and protected by permanent construction immediately after installation.

- C. Correct deficiencies in or remove waterproofing that does not comply with requirements; repair substrates, reapply waterproofing, and repair sheet flashings.
- D. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 07 1326

## SECTION 07 1800 - TRAFFIC COATINGS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes traffic coatings and pavement markings for the following applications:

1. Mechanical floors at penthouse.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product, including installation instructions.

- B. LEED Submittals:

1. Product Data for Credit IEQ 4.2: For interior field-applied traffic coatings, and pavement marking paint documentation including printed statement of VOC content.

- C. Shop Drawings: For traffic coatings.

1. Include details for treating substrate joints and cracks, flashings, deck penetrations, and other termination conditions.

- D. Samples: For each exposed product and for each color and texture specified.

#### 1.3 INFORMATIONAL SUBMITTALS

- A. Product certificates.

- B. Sample warranty.

#### 1.4 CLOSEOUT SUBMITTALS

- A. Maintenance data.

#### 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

1.6 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace traffic coating that fails in materials or workmanship within specified warranty period.
  - 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Material Compatibility: Provide primers; base and topcoat; and accessory materials that are compatible with one another and with substrate under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

2.2 TRAFFIC COATING

- A. Traffic Coating: Manufacturer's standard, traffic-bearing, seamless, high-solids-content, cold liquid-applied, elastomeric, waterproofing membrane system with integral wearing surface for equipment-room floor; according to ASTM C 957.
  - 1. Basis-of-Design Product: Subject to compliance with requirements, provide **Carlisle CCW-5113** or comparable product by one of the following:
    - a. Advanced Polymer Technology Corporation.
    - b. BASF Construction Chemicals, LLC - Building Systems.
    - c. Euclid Chemical Company (The); an RPM company.
    - d. Gaco Western LLC.
    - e. Key Resin Company.
    - f. Neogard; Division of Jones-Blair.
    - g. Pacific Polymers International, Inc.
    - h. ParexLahabra, Inc.
    - i. Pecora Corporation.
    - j. POLY-CARB, Inc.
    - k. Sherwin-Williams Company (The).
    - l. Tremco Incorporated; an RPM company.
- B. Primer: Liquid primer recommended for substrate and conditions by traffic-coating manufacturer.
- C. Preparatory and Base Coats: Polyurethane.
- D. Topcoat: Aliphatic polyurethane.
  - 1. Color: As selected by Architect from manufacturer's full range.

- E. Aggregate: Manufacturer's standard aggregate for each use indicated of particle sizes, shape, and minimum hardness recommended in writing by traffic-coating manufacturer.
- F. Fire-Test-Response Characteristics: Provide traffic-coating materials with the fire-test-response characteristics as determined by testing identical products per test method below for deck type and slopes indicated by an independent testing and inspecting agency that is acceptable to authorities having jurisdiction.
- G. VOC Content: Traffic coating shall have a VOC content of 150 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

## 2.3 ACCESSORY MATERIALS

- A. Joint Sealants: As specified in Section 07 9200 "Joint Sealants."
- B. Sheet Flashing: Nonstaining sheet material recommended in writing by traffic-coating manufacturer.
- C. Adhesive: Contact adhesive recommended in writing by traffic-coating manufacturer.
- D. Reinforcing Strip: Fiberglass mesh recommended in writing by traffic-coating manufacturer.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. General: Clean and prepare substrates according to ASTM C 1127 and manufacturer's written instructions to produce clean, dust-free, dry substrate for traffic-coating application.
  - 1. Application of coating indicates acceptance of surfaces and conditions.
- B. Mask adjoining surfaces not receiving traffic coatings to prevent overspray, spillage, leaking, and migration of coatings. Prevent traffic-coating materials from entering deck substrate penetrations and clogging weep holes and drains.
- C. Concrete Substrates: Mechanically abrade surface to a uniform profile acceptable to manufacturer, according to ASTM D 4259. Do not acid etch.
  - 1. Remove grease, oil, paints, and other penetrating contaminants from concrete.
  - 2. Remove concrete fins, ridges, and other projections.
  - 3. Remove laitance, glaze, efflorescence, curing compounds, concrete hardeners, form-release agents, and other incompatible materials that might affect coating adhesion.
  - 4. Remove remaining loose material to provide a sound surface, and clean surfaces according to ASTM D 4258.

### 3.2 TERMINATIONS AND PENETRATIONS

- A. Prepare vertical and horizontal surfaces at terminations and penetrations through traffic coatings and at expansion joints, drains, and sleeves according to ASTM C 1127 and manufacturer's written instructions.
- B. Provide sealant cants at penetrations and at reinforced and nonreinforced, deck-to-wall butt joints.
- C. Terminate edges of deck-to-deck expansion joints with preparatory base-coat strip.
- D. Install sheet flashings at deck-to-wall expansion and dynamic joints, and bond to deck and wall substrates according to manufacturer's written recommendations.

### 3.3 JOINT AND CRACK TREATMENT

- A. Prepare, treat, rout, and fill joints and cracks in substrates according to ASTM C 1127 and manufacturer's written recommendations. Before coating surfaces, remove dust and dirt from joints and cracks according to ASTM D 4258.
  - 1. Comply with recommendations in ASTM C 1193 for joint-sealant installation.
- B. Apply reinforcing strip in traffic-coating system where recommended in writing by traffic-coating manufacturer.

### 3.4 TRAFFIC-COATING APPLICATION

- A. Apply traffic coating according to ASTM C 1127 and manufacturer's written instructions.
- B. Apply number of coats of specified compositions for each type of traffic coating at locations as indicated on Drawings.
- C. Apply traffic coatings to prepared wall terminations and vertical surfaces to height indicated; omit aggregate on vertical surfaces.
- D. Cure traffic coatings.

### 3.5 PROTECTING AND CLEANING

- A. Protect traffic coatings from damage and wear during remainder of construction period.
- B. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 07 1800

## SECTION 07 1900 - WATER REPELLENTS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes penetrating water-repellent treatments for the following vertical and horizontal surfaces:
  - 1. Concrete unit masonry.
  - 2. Clay brick masonry.
- B. Related Sections:
  - 1. Division 04 sections for integral water-repellent admixture for unit masonry assemblies.

#### 1.2 PERFORMANCE REQUIREMENTS

- A. General Performance: Water repellents shall meet performance requirements indicated without failure due to defective manufacture, fabrication, or installation.
  - 1. Water Repellents: Comply with performance requirements specified, as determined by testing on manufacturer's standard substrate assemblies representing those indicated for this Project.
- B. Water Absorption: Minimum 90 percent reduction of water absorption after 24 hours in comparison of treated and untreated specimens.
  - 1. Concrete Masonry Units: ASTM C 140.
  - 2. Clay Brick: ASTM C 67.
- C. Water-Vapor Transmission: Comply with one or both of the following:
  - 1. Maximum 10 percent reduction in rate of vapor transmission in comparison of treated and untreated specimens, according to ASTM E 96/E 96M.
  - 2. Minimum 80 percent water-vapor transmission in comparison of treated and untreated specimens, according to ASTM D 1653.
- D. Water Penetration and Leakage through Masonry: Minimum 90 percent reduction in leakage rate in comparison of treated and untreated specimens, according to ASTM E 514.
- E. Durability: Maximum 5 percent loss of water-repellent properties after 2500 hours of weathering according to ASTM G 154 in comparison to water-repellent-treated specimens before weathering.
- F. Chloride-Ion Intrusion in Concrete: NCHRP Report 244, Series II tests.

1. Reduction of Water Absorption: 80 percent.
2. Reduction in Chloride Content: 80 percent.

### 1.3 PRECONSTRUCTION TESTING

- A. Preconstruction Testing: Installed water repellents shall comply with performance requirements indicated, as evidenced by reports of tests performed on manufacturer's standard substrate assemblies by a qualified testing agency.
1. Select sizes and configurations of assemblies to adequately demonstrate capability of water repellents to comply with performance requirements.
  2. In addition to verifying performance requirements, use test applications to verify manufacturer's written instructions for application procedure and optimum rates of product application to substrate assemblies.
  3. Notify Architect seven days in advance of the dates and times when assemblies will be tested.

### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
1. Include manufacturer's printed statement of VOC content.
  2. Include manufacturer's recommended number of coats for each type of substrate and spreading rate for each separate coat.

### 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Applicator and testing agency.
- B. Product Certificates: For each type of water repellent, from manufacturer.
- C. Preconstruction Testing Reports: For water-repellent-treated substrates.
- D. Field quality-control reports.
- E. Warranty: Special warranty specified in this Section.

### 1.6 QUALITY ASSURANCE

- A. Applicator Qualifications: An employer of workers trained and approved by manufacturer.
- B. Mockups: Apply water repellent to each type of substrate required.
1. Locate each test application as directed by Architect.
  2. Size: 10 sq. ft..
  3. Final approval by Architect of water-repellent application will be from test applications.

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

## 1.7 PROJECT CONDITIONS

- A. Limitations: Proceed with application only when the following existing and forecasted weather and substrate conditions permit water repellents to be applied according to manufacturers' written instructions and warranty requirements:
  - 1. Mortar has cured for not less than 28 days.
  - 2. Building has been closed in for not less than 30 days before treating wall assemblies.
  - 3. Ambient temperature is above 40 deg F and below 100 deg F and will remain so for 24 hours.
  - 4. Substrate is not frozen and substrate-surface temperature is above 40 deg F and below 100 deg F.
  - 5. Rain or snow is not predicted within 24 hours.
  - 6. Not less than 24 hours have passed since surfaces were last wet.
  - 7. Windy conditions do not exist that might cause water repellent to be blown onto vegetation or surfaces not intended to be treated.

## 1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer and Applicator agree to repair or replace materials that fail to maintain water repellency specified in "Performance Requirements" Article within specified warranty period.
  - 1. Warranty Period: Five years from date of Substantial Completion.
  - 2. For duration of warranty period, brick masonry must meet loss of water repellency requirements of RILEM Method II for 1 mil/20 minutes or less, equivalent to 60 mph wind driven rain.

## PART 2 - PRODUCTS

### 2.1 PENETRATING WATER REPELLENTS

- A. At Brick: Silane/Siloxane-Blend, Penetrating Water Repellent: Clear, silane and siloxane blend with 400 g/L or less of VOCs.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. BASF Construction Chemicals, LLC; Enviroseal Double 7 for Brick.
    - b. L&M Construction Chemicals, Inc.; Aquapel Plus.
    - c. OKON Co., Inc., Division of ZINSSER Co., Inc., an RPM company; S-40.
    - d. Pecora Corporation; KlereSeal 920-W.
    - e. PROSOCO, Inc.; Weather Seal GP.
    - f. Sika Corporation, Inc.; Sikagard 701W.

- B. At CMU: Silane/Siloxane-Blend, Penetrating Water Repellent: Clear, silane and siloxane blend with 400 g/L or less of VOCs.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. BASF Construction Chemicals, LLC; Enviroseal PBT.
    - b. L&M Construction Chemicals, Inc.; Hydroblock.
    - c. PROSOCO, Inc.; Sure Klean Weather Seal Siloxane WD.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements and conditions affecting performance of the Work.
  - 1. Verify that surfaces are clean and dry according to water-repellent manufacturer's requirements. Check moisture content in three representative locations by method recommended by manufacturer.
  - 2. Inspect for previously applied treatments that may inhibit penetration or performance of water repellents.
  - 3. Verify that there is no efflorescence or other removable residues that would be trapped beneath the application of water repellent.
  - 4. Verify that required repairs are complete, cured, and dry before applying water repellent.
- B. Test pH level according to water-repellent manufacturer's written instructions to ensure chemical bond to silica-containing or siliceous minerals.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. Cleaning: Before application of water repellent, clean substrate of substances that could impair penetration or performance of product according to water-repellent manufacturer's written instructions and as follows:
  - 1. Concrete Unit Masonry: Remove oil, curing compounds, laitance, and other substances that inhibit penetration or performance of water repellents according to ASTM E 1857.
  - 2. Clay Brick Masonry: ASTM D 5703.
- B. Protect adjoining work, including mortar and sealant bond surfaces, from spillage or blow-over of water repellent. Cover adjoining and nearby surfaces of aluminum and glass if there is the possibility of water repellent being deposited on surfaces. Cover live vegetation.
- C. Coordination with Mortar Joints: Do not apply water repellent until pointing mortar for joints adjacent to surfaces receiving water-repellent treatment has been installed and cured.

- D. Coordination with Sealant Joints: Do not apply water repellent until sealants for joints adjacent to surfaces receiving water-repellent treatment have been installed and cured.
  - 1. Water-repellent work may precede sealant application only if sealant adhesion and compatibility have been tested and verified using substrate, water repellent, and sealant materials identical to those required.

### 3.3 APPLICATION

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect the substrate before application of water repellent and to instruct Applicator on the product and application method to be used.
- B. Apply a heavy-saturation coating of water repellent, on surfaces indicated for treatment, using 15 psi- pressure spray with a fan-type spray nozzle to the point of saturation. Apply coating in dual passes of uniform, overlapping strokes. Remove excess material; do not allow material to puddle beyond saturation. Comply with manufacturer's written instructions for application procedure unless otherwise indicated.
- C. Apply a second saturation coating, repeating first application. Comply with manufacturer's written instructions for limitations on drying time between coats and after rainstorm wetting of surfaces between coats. Consult manufacturer's technical representative if written instructions are not applicable to Project conditions.

### 3.4 FIELD QUALITY CONTROL

- A. Testing of Water-Repellent Material: Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when water repellent is being applied:
  - 1. Testing agency will perform tests for compliance of water-repellent material with product requirements.
  - 2. Owner may direct Contractor to stop applying water repellents if test results show material being used does not comply with product requirements. Contractor shall remove noncomplying material from Project site, pay for testing, and correct deficiency of surfaces treated with rejected materials, as approved by Architect..
- B. Coverage Test: In the presence of Architect, hose down a dry, repellent-treated surface to verify complete and uniform product application. A change in surface color will indicate incomplete application.
  - 1. Notify Architect seven days in advance of the dates and times when surfaces will be tested.
  - 2. Reapply water repellent until coverage test indicates complete coverage.

3.5 CLEANING

- A. Immediately clean water repellent from adjoining surfaces and surfaces soiled or damaged by water-repellent application as work progresses. Correct damage to work of other trades caused by water-repellent application, as approved by Architect.
- B. Comply with manufacturer's written cleaning instructions.

END OF SECTION 07 1900

## SECTION 07 2100 - THERMAL INSULATION

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Foam-plastic board insulation.
2. Glass-fiber blanket insulation.
3. Closed-cell spray polyurethane foam insulation.

##### B. Related Sections:

1. Section 07 5419 Polyvinyl-Chloride (PVC) Roofing for insulation specified as part of roofing construction.
2. Section 09 2116 "Gypsum Board Shaft Wall Assemblies" for installation in metal-framed assemblies of insulation specified by referencing this Section.

#### 1.2 ACTION SUBMITTALS

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

##### B. LEED Submittals:

1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

#### 1.3 INFORMATIONAL SUBMITTALS

##### A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.

##### B. Research/Evaluation Reports: For foam-plastic insulation, from ICC-ES.

#### 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.

### 1.5 DELIVERY, STORAGE, AND HANDLING

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

## PART 2 - PRODUCTS

### 2.1 FOAM-PLASTIC BOARD INSULATION

- A. Foil-Faced, Polyisocyanurate Board Insulation: ASTM C 1289, Type I, Class 1, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Atlas Roofing Corporation.
    - b. Dow Chemical Company (The).
    - c. Rmax, Inc.
- B. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

### 2.2 GLASS-FIBER BLANKET INSULATION

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. CertainTeed Corporation.
  - 2. Johns Manville.
  - 3. Knauf Insulation.
  - 4. Owens Corning.
- B. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 20 percent.

- C. Unfaced, Glass-Fiber Blanket Insulation: ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
- D. Sustainability Requirements: Provide glass-fiber blanket insulation as follows:
  - 1. Free of Formaldehyde: Insulation manufactured with 100 percent acrylic binders and no formaldehyde.
  - 2. Low Emitting: Insulation tested according to ASTM D 5116 and shown to emit less than 0.05-ppm formaldehyde.

### 2.3 SPRAY POLYURETHANE FOAM INSULATION

- A. Closed-Cell Polyurethane Foam Insulation: ASTM C 1029, Type II, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. BASF Corporation.
    - b. Dow Chemical Company (The).
    - c. Gaco Western Inc.
    - d. Henry Company.
  - 2. Minimum density of 1.5 lb/cu. ft., thermal resistivity of 6.2 deg F x h x sq. ft./Btu x in. at 75 deg F.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Clean substrates of substances that are harmful to insulation or that interfere with insulation attachment.

### 3.2 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- C. Extend insulation 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. 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.

### 3.3 INSTALLATION OF CAVITY-WALL INSULATION

- A. Foam-Plastic Board Insulation: Install pads of adhesive spaced approximately 24 inches o.c. both ways on inside face, and as recommended by manufacturer. Fit courses of insulation between wall ties and other obstructions, with edges butted tightly in both directions. Press units firmly against inside substrates.
  - 1. Supplement adhesive attachment of insulation by securing boards with two-piece wall ties designed for this purpose.
  - 2. **General Contractor may choose to have mason bid installation of rigid cavity insulation due to sequencing of installation with masonry ties.**

### 3.4 INSTALLATION OF INSULATION FOR FRAMED CONSTRUCTION

- 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. Foam-Plastic Board Insulation: Seal joints between units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.
- C. Glass-Fiber Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
  - 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
  - 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
  - 3. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
  - 4. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
- D. Spray-Applied Insulation: Apply spray-applied insulation according to manufacturer's written instructions. Do not apply insulation until installation of pipes, ducts, conduits, wiring, and electrical outlets in walls is completed and windows, electrical boxes, and other items not indicated to receive insulation are masked. After insulation is applied, make flush with face of studs by using method recommended by insulation manufacturer.

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

- 1. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.

### 3.5 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 07 2100

## SECTION 07 2713 - MODIFIED BITUMINOUS SHEET AIR BARRIERS

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section includes:

1. Self-adhering, vapor-retarding, modified bituminous sheet air barriers.
2. Flexible flashing at masonry walls.

B. Related Requirements:

1. Section 06 1600 "Sheathing" for wall sheathings and wall sheathing joint-and-penetration treatments.

#### 1.2 DEFINITIONS

- A. Air-Barrier Material: A primary element that provides a continuous barrier to the movement of air.
- B. Air-Barrier Accessory: A transitional component of the air barrier that provides continuity.
- C. Air-Barrier Assembly: The collection of air-barrier materials and accessory materials applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

#### 1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review air-barrier requirements and installation, special details, mockups, air-leakage and bond testing, air-barrier protection, and work scheduling that covers air barriers.

#### 1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer's written instructions for evaluating, preparing, and treating substrate; technical data; and tested physical and performance properties of products.

B. LEED Submittals:

1. Product Data for Credit IEQ 4.2: For air-barrier products, documentation including printed statement of VOC content.

C. Shop Drawings: For air-barrier assemblies.

1. Show locations and extent of air barrier. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
2. Include details of interfaces with other materials that form part of air barrier.
3. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer. Include list of ABAA-certified installers and supervisors employed by the Installer, who work on Project.
- B. Product Certificates: From air-barrier manufacturer, certifying compatibility of air barriers and accessory materials with Project materials that connect to or that come in contact with air barrier.
- C. Product Test Reports: For each air-barrier assembly, for tests performed by a qualified testing agency.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
  1. Installer shall be licensed by ABAA according to ABAA's Quality Assurance Program and shall employ ABAA-certified installers and supervisors on Project.
- B. Mockups: Build mockups to set quality standards for materials and execution.
  1. Build integrated mockups of exterior wall assembly , 150 sq. ft., incorporating backup wall construction, external cladding, window, storefront, door frame and sill, insulation, ties and other penetrations, and flashing to demonstrate surface preparation, crack and joint treatment, application of air barriers, and sealing of gaps, terminations, and penetrations of air-barrier assembly.
    - a. Coordinate construction of mockups to permit inspection by Owner's testing agency of air barrier before external insulation and cladding are installed.
    - b. Include junction with roofing membrane, building corner condition, and foundation wall intersection.
    - c. If Architect determines mockups do not comply with requirements, reconstruct mockups and apply air barrier until mockups are approved.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

#### 1.7 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Owner will engage a qualified testing agency to perform preconstruction testing on field mockups.
- B. Mockup Testing: Air-barrier assemblies shall comply with performance requirements indicated, as evidenced by reports based on mockup testing by a qualified testing agency.
  1. Qualitative Air-Leakage Testing: Mockups will be tested for evidence of air leakage according to ASTM E 1186, chamber pressurization or depressurization with smoke tracers.
  2. Adhesion Testing: Mockups will be tested for minimum air-barrier adhesion of 16 lbf/sq. in. according to ASTM D 4541.
  3. Notify Architect seven days in advance of the dates and times when mockups will be tested.

#### 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Remove and replace liquid materials that cannot be applied within their stated shelf life.
- B. Protect stored materials from direct sunlight.

#### 1.9 FIELD CONDITIONS

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

### PART 2 - PRODUCTS

#### 2.1 MATERIALS, GENERAL

- A. Source Limitations: Obtain primary air-barrier materials and air-barrier accessories from single source from single manufacturer.
- B. VOC Content: 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24) and complying with VOC content limits of authorities having jurisdiction.

## 2.2 PERFORMANCE REQUIREMENTS

- A. General: Air barrier shall be capable of performing as a continuous vapor-retarding air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air-barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, tie-ins to installed waterproofing, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.
- B. Air-Barrier Assembly Air Leakage: Maximum 0.04 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft., when tested according to ASTM E 2357.

## 2.3 SELF-ADHERING SHEET AIR BARRIER

- A. Modified Bituminous Sheet: 40-mil- thick, self-adhering sheet consisting of 36 mils of rubberized asphalt laminated to a 4-mil- thick, cross-laminated polyethylene film with release liner on adhesive side and formulated for application with primer that complies with VOC limits of authorities having jurisdiction.
  - 1. Basis of Design Product: Subject to compliance with requirements, provide **Blueskin SA** as provided by **Henry Company**, or one of the following approved in writing by Architect prior to bid:
    - a. Grace, W. R. & Co. - Conn.; Perm-A-Barrier Wall Membrane.
    - b. Meadows, W. R., Inc.; SealTight Air-Shield.
  - 2. Physical and Performance Properties:
    - a. Air Permeance: Maximum 0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. pressure difference; ASTM E 2178.
    - b. Tensile Strength: Minimum 250 psi; ASTM D 412, Die C.
    - c. Ultimate Elongation: Minimum 200 percent; ASTM D 412, Die C.
    - d. Puncture Resistance: Minimum 40 lbf; ASTM E 154.
    - e. Water Absorption: Maximum 0.15 percent weight gain after 48-hour immersion at 70 deg F; ASTM D 570.
    - f. Vapor Permeance: Maximum 0.05 perm; ASTM E 96/E 96M, Water Method.

## 2.4 EMBEDDED FLEXIBLE FLASHING MATERIALS AT MASONRY WALLS

- A. Flexible Flashing: Use the following unless otherwise indicated:
  - 1. Rubberized-Asphalt Flashing: Composite flashing product consisting of a pliable, adhesive rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of not less than 0.040 inch.
    - a. Products: Subject to compliance with requirements, provide one of the following:

- 1) Grace Construction Products, W. R. Grace & Co. - Conn.; Perm-A-Barrier Wall Flashing.
- 2) W. R. Meadows, Inc.; Air-Shield Thru-Wall Flashing.
- 3) Polyguard Products, Inc.; Polyguard 400.

b. Accessories: Provide preformed corners, end dams, other special shapes, and seaming materials produced by flashing manufacturer.

B. Application: Unless otherwise indicated, use the following where flashing is fully concealed, use flexible flashing.

## 2.5 ACCESSORY MATERIALS

- A. General: Accessory materials recommended by air-barrier manufacturer to produce a complete air-barrier assembly and compatible with primary air-barrier membrane.
- B. Primer: Liquid primer recommended for substrate by air-barrier material manufacturer.
- C. Counterflashing Strip: Modified bituminous 40-mil- thick, self-adhering sheet consisting of 32 mils of rubberized asphalt laminated to an 8-mil- thick, cross-laminated polyethylene film with release liner backing.
- D. Butyl Strip: Vapor retarding, 30 to 40 mils thick, self-adhering; polyethylene-film-reinforced top surface laminated to layer of butyl adhesive, with release liner backing.
- E. Modified Bituminous Strip: Vapor retarding, 40 mils thick, smooth surfaced, self-adhering; consisting of 36 mils of rubberized asphalt laminated to a 4-mil- thick, cross-laminated polyethylene film with release liner backing.
- F. Termination Mastic: Air-barrier manufacturer's standard cold fluid-applied elastomeric liquid; trowel grade.
- G. Substrate-Patching Membrane: Manufacturer's standard trowel-grade substrate filler.
- H. Adhesive and Tape: Air-barrier manufacturer's standard adhesive and pressure-sensitive adhesive tape.
- I. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304, 0.0250 inch thick, and Series 300 stainless-steel fasteners.
- J. Sprayed Polyurethane Foam Sealant: One- or two-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.
- K. Modified Bituminous Transition Strip: Vapor retarding, 40 mils thick, smooth surfaced, self-adhering; consisting of 36 mils of rubberized asphalt laminated to a 4-mil- thick polyethylene film with release liner backing.

- L. Elastomeric Flashing Sheet: ASTM D 2000, minimum 50- to 65-mil- thick, cured sheet neoprene with manufacturer-recommended contact adhesives and lap sealant with stainless-steel termination bars and fasteners.
- M. Joint Sealant: ASTM C 920, single-component, neutral-curing silicone; Class 100/50 (low modulus), Grade NS, Use NT related to exposure, and, as applicable to joint substrates indicated, Use O. Comply with Section 07 9200 "Joint Sealants."

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
  - 1. Verify that 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. Verify that masonry joints are flush and completely filled with mortar.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 SURFACE PREPARATION

- A. Clean, prepare, and treat substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for air-barrier application.
- 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 and other penetrating contaminants or film-forming coatings from concrete.
- D. Remove excess mortar from masonry ties, shelf angles, and other obstructions.
- E. 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.
- F. Bridge and cover expansion joints and discontinuous wall-to-wall joints with overlapping modified bituminous strips.

- G. 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.
- H. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

### 3.3 INSTALLATION

- A. General: Install modified bituminous sheets and accessory materials according to air-barrier manufacturer's written instructions and according to recommendations in ASTM D 6135.
  - 1. When ambient and substrate temperatures range between 25 and 40 deg F, install self-adhering, modified bituminous air-barrier sheet produced for low-temperature application. Do not install low-temperature sheet if ambient or substrate temperature is higher than 60 deg F.
- B. Corners: Prepare, prime, and treat inside and outside corners according to ASTM D 6135.
  - 1. Install modified bituminous strips centered over vertical inside corners. Install 3/4-inch fillets of termination mastic on horizontal inside corners.
- C. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations with termination mastic and according to ASTM D 6135.
- D. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by air-barrier sheet on same day. Reprime areas exposed for more than 24 hours.
- E. Apply and firmly adhere modified bituminous sheets horizontally over area to receive air barrier. Accurately align sheets and maintain uniform 2-1/2-inch- minimum lap widths and end laps. Overlap and seal seams, and stagger end laps to ensure airtight installation.
  - 1. Apply sheets in a shingled manner to shed water without interception by any exposed sheet edges.
  - 2. Roll sheets firmly to enhance adhesion to substrate.
- F. Apply continuous modified bituminous sheets over modified bituminous strips bridging substrate cracks, construction, and contraction joints.
- G. Flexible Flashing at Masonry:
  - 1. General: Install embedded flexible flashing in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.
  - 2. Install flexible flashing as follows unless otherwise indicated:
    - a. Prepare surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal

- penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
- b. At masonry-veneer walls, extend flashing through veneer, across air space behind veneer, and up face of sheathing at least 8 inches; with upper edge tucked under air barrier, lapping at least 4 inches.
  - c. At lintels and shelf angles, extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.
  - d. Cut flexible flashing off flush with face of wall after masonry wall construction is completed.
- H. CMU: Install air-barrier sheet horizontally against the CMU beginning at base of wall. Align top edge of air-barrier sheet immediately below protruding masonry ties or joint reinforcement or ties, and firmly adhere in place.
1. Overlap horizontally adjacent sheets a minimum of 2 inches and roll seams.
  2. Apply overlapping sheets with bottom edge slit to fit around masonry reinforcing or ties. Roll firmly into place.
  3. Seal around masonry reinforcing or ties and penetrations with termination mastic.
  4. Continue the membrane into all openings in the wall, such as doors and windows, and terminate at points to maintain an airtight barrier that is not visible from interior.
- I. Seal top of through-wall flashings to air-barrier sheet with an additional 6-inch- wide, modified bituminous strip.
- J. Seal exposed edges of sheet at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.
- K. Install air-barrier sheet and accessory materials to form a seal with adjacent construction and to maintain a continuous air barrier.
1. Coordinate air-barrier installation 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 each substrate.
- L. 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.
- M. 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 each substrate. 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.

- N. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, doors, and miscellaneous penetrations of air-barrier membrane with foam sealant.
- O. At end of each working day, seal top edge of air-barrier material to substrate with termination mastic.
- P. 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.
- Q. Repair punctures, voids, and deficient lapped seams in air barrier. Slit and flatten fishmouths and blisters. Patch with air-barrier sheet extending 6 inches beyond repaired areas in all directions.
- R. Do not cover air barrier until it has been tested and inspected by Owner's testing agency.
- S. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air-barrier components.

#### 3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Inspections: Air-barrier materials, accessories, and installation are subject to inspection for compliance with requirements. Inspections may include the following:
  - 1. Continuity of air-barrier system has been achieved throughout the building envelope with no gaps or holes.
  - 2. Continuous structural support of air-barrier system has been provided.
  - 3. Masonry surfaces are smooth, clean, and free of cavities, protrusions, and mortar droppings.
  - 4. Site conditions for application temperature and dryness of substrates have been maintained.
  - 5. Maximum exposure time of materials to UV deterioration has not been exceeded.
  - 6. Surfaces have been primed.
  - 7. Laps in sheet materials have complied with the minimum requirements and have been shingled in the correct direction (or mastic applied on exposed edges), with no fishmouths.
  - 8. Termination mastic has been applied on cut edges.
  - 9. Air barrier has been firmly adhered to substrate.
  - 10. Compatible materials have been used.
  - 11. Transitions at changes in direction and structural support at gaps have been provided.
  - 12. Connections between assemblies (membrane and sealants) have complied with requirements for cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.
  - 13. All penetrations have been sealed.
- C. Tests: As determined by Owner's testing agency from among the following tests:

1. Qualitative Air-Leakage Testing: Air-barrier assemblies will be tested for evidence of air leakage according to ASTM E 1186, smoke pencil with pressurization or depressurization or ASTM E 1186, chamber pressurization or depressurization with smoke tracers.
2. Adhesion Testing: Air-barrier assemblies will be tested for minimum air-barrier adhesion of 16 lbf/sq. in. according to ASTM D 4541 for each 600 sq. ft. of installed air barrier or part thereof.

D. Air barriers will be considered defective if they do not pass tests and inspections.

1. Apply additional air-barrier material, according to manufacturer's written instructions, where inspection results indicate insufficient thickness.
2. Remove and replace deficient air-barrier components for retesting as specified above.

E. Repair damage to air barriers caused by testing; follow manufacturer's written instructions.

### 3.5 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. If exposed to these conditions for more than 30 days, remove and replace air barrier or install additional, full-thickness, air-barrier application after repairing and preparing the overexposed membrane according to air-barrier manufacturer's written instructions.
2. Protect air barrier from contact with incompatible materials 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.

END OF SECTION 07 2713

## SECTION 07 4213 - FORMED METAL WALL AND SOFFIT PANELS

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Flush-Profile, Concealed-Fastener Aluminum Plate Wall Panels.
2. Corrugated Raised-Rib Profile, Concealed-Fastener Metal Wall Panels

#### 1.2 PREINSTALLATION MEETINGS

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

1. Meet with Owner, Architect, Owner's insurer if applicable, metal panel Installer, metal panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal panels, including installers of doors, windows, and louvers.
2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review methods and procedures related to metal panel installation, including manufacturer's written instructions.
4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
5. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that affect metal panels.
6. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
7. Review temporary protection requirements for metal panel assembly during and after installation.
8. Review of procedures for repair of metal panels damaged after installation.
9. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

#### 1.3 ACTION SUBMITTALS

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

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.

##### B. LEED Submittals:

1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

C. Shop Drawings:

1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, soffits, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
2. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches.

D. Samples for Initial Selection: For each type of metal panel indicated with factory-applied finishes.

1. Include Samples of trim and accessories involving color selection.

E. Samples for Verification: For each type of exposed finish, prepared on Samples of size indicated below:

1. Metal Panels: 12 inches long by actual panel width. Include fasteners, closures, and other metal panel accessories.

F. Delegated-Design Submittal: For metal wall panels systems and metal soffit panel 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.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- C. Field quality-control reports.
- D. Sample Warranties: For special warranties.

1.5 CLOSEOUT SUBMITTALS

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

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

- B. UL-Certified, Portable Roll-Forming Equipment: UL-certified, portable roll-forming equipment capable of producing metal panels warranted by manufacturer to be the same as factory-formed products. Maintain UL certification of portable roll-forming equipment for duration of work.
- C. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
  - 1. Build mockup of typical metal panel assembly, including corner, supports, soffit, attachments, and accessories.
  - 2. Water-Spray Test: Conduct water-spray test of metal panel assembly mockup, testing for water penetration according to AAMA 501.2.
  - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
  - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.
- B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Retain strippable protective covering on metal panels during installation.

#### 1.8 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

#### 1.9 COORDINATION

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

## 1.10 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Structural failures including rupturing, cracking, or puncturing.
    - b. Deterioration of metals and other materials beyond normal weathering.
  - 2. Warranty Period: Two years from date of Substantial Completion.
- B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
  - 1. 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 PERFORMANCE REQUIREMENTS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 4000 "Quality Requirements," to verify adequacy of substructure design indicated in drawings or, if not adequately indicated, to design substructure for metal panel systems.
- C. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 1592:
  - 1. Wind Loads: As indicated on Drawings.
  - 2. Other Design Loads: As indicated on Drawings.
  - 3. Deflection Limits: For wind loads, no greater than 1/240 of the span.
- D. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. when tested according to ASTM E 283 at the following test-pressure difference:
  - 1. Test-Pressure Difference: 6.24 lbf/sq. ft.

- E. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 331 at the following test-pressure difference:
  - 1. Test-Pressure Difference: 6.24 lbf/sq. ft.
- F. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
  - 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

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

- A. General: Provide factory-formed metal 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. Flush-Profile, Concealed-Fastener Aluminum Plate Wall Panels: Formed with vertical panel edges and a flat pan between panel edges; with flush joint between panels.
  - 1. Basis-of-Design Product: Subject to compliance with requirements, provide **Una-Clad Series 4500 Aluminum Plate System** as provided by **Firestone Metal Products** or an equivalent product complying with requirements and approved by architect prior to bid, by another manufacturer.
  - 2. Aluminum Sheet: Coil-coated sheet, ASTM B 209, alloy as standard with manufacturer, with temper as required to suit forming operations and structural performance required.
    - a. Thickness: 0.125 inch.
    - b. Surface: Smooth, flat finish.
    - c. Exterior Finish: Two-coat fluoropolymer.
    - d. Color: Medium bronze, custom color to match Architect's Sample.
  - 3. Panel Coverage: As indicated.
  - 4. Panel Height: 2 inches.
- C. Corrugated Raised-Rib Profile, Concealed-Fastener Metal Wall Panels: Formed with raised tapered ribs evenly spaced across panel width.
  - 1. Basis-of-Design Product: Subject to compliance with requirements, provide **Una-Clad Delta Series CFP-16F System** as provided by **Firestone Metal Products** or an equivalent product complying with requirements and approved by architect prior to bid, by another manufacturer.
  - 2. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with ASTM A 653/A 653M, G90 coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A 792/A 792M, Class AZ50 coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A 755/A 755M.

- a. Nominal Thickness: 0.028 inch.
  - b. Exterior Finish: Two-coat fluoropolymer.
  - c. Color: Medium bronze, custom color to match Architect's Sample.
3. Panel Coverage: 16 inches.
  4. Panel Height: 0.813 inch.
  5. Rib to Rib:
    - a. 4 inches, where indicated.
    - b. 8 inches, where indicated.
  6. Panel Direction: Horizontal.

### 2.3 METAL SOFFIT PANELS

- A. General: Provide 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. Metal Soffit Panels: Match profile and material of metal wall panels.
  1. Finish: Match finish and color of metal wall panels.
  2. Sealant: Factory applied within interlocking joint.
- C. Flush-Profile Metal Soffit Panels: Solid panels formed with vertical panel edges and a flat pan between panel edges; with flush joint between panels.
  1. Basis-of-Design Product: Subject to compliance with requirements, provide **Una-Clad Series UC 501 Reveal Flush Panel System** as provided by **Firestone Metal Products** or an equivalent product complying with requirements and approved by architect prior to bid, by another manufacturer.
  2. Aluminum Sheet: Coil-coated sheet, ASTM B 209, alloy as standard with manufacturer, with temper as required to suit forming operations and structural performance required.
    - a. Thickness: 0.040 inch.
    - b. Surface: Smooth, flat finish.
    - c. Exterior Finish: Two-coat fluoropolymer.
    - d. Color: Medium bronze, custom color to match Architect's Sample.
  3. Panel Coverage: 16 inches.
  4. Panel Height: 1.0 inch.

### 2.4 MISCELLANEOUS MATERIALS

- A. Miscellaneous Metal Subframing and Furring: ASTM C 645, cold-formed, metallic-coated steel sheet, ASTM A 653/A 653M, G90 coating designation or ASTM A 792/A 792M,

Class AZ50 aluminum-zinc-alloy coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.

- B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.
  - 1. Closures: Provide closures at eaves and rakes, fabricated of same metal as metal panels.
  - 2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
  - 3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, 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 panels.
- D. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal panels by means of plastic caps or factory-applied coating. Provide EPDM sealing washers for exposed fasteners.
- E. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.
  - 1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.
  - 2. Joint Sealant: ASTM C 920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.
  - 3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

## 2.5 FABRICATION

- A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.

- C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- D. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.
- E. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.
  - 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 Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
  - 3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
  - 4. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
  - 5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
  - 6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal 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.

## 2.6 FINISHES

- A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. 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 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.
- C. Steel Panels and Accessories:
  - 1. Two-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.

2. 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.

D. Aluminum Panels and Accessories:

1. Two-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the 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.
    - a. Verify that air-barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.

#### 3.3 METAL PANEL INSTALLATION

- A. General: Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise

indicated. Anchor metal 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 panels.
2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
3. Install screw fasteners in predrilled holes.
4. Locate and space fastenings in uniform vertical and horizontal alignment.
5. Install flashing and trim as metal panel work proceeds.
6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
7. Align bottoms of metal 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 panels.

B. Fasteners:

1. Steel Panels: Use stainless-steel fasteners for surfaces exposed to the exterior; use galvanized-steel fasteners for surfaces exposed to the interior.
2. Aluminum Panels: Use aluminum or stainless-steel fasteners for surfaces exposed to the exterior; use aluminum or galvanized-steel fasteners for surfaces exposed to the interior.

C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.

D. Lap-Seam Metal Panels: Fasten metal panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.

1. Lap ribbed or fluted sheets one full rib. Apply panels and associated items true to line for neat and weathertight enclosure.
2. Provide metal-backed washers under heads of exposed fasteners bearing on weather side of metal panels.
3. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.
4. Install screw fasteners with power tools having controlled torque adjusted to compress washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.
5. Flash and seal panels with weather closures at perimeter of all openings.

E. Watertight Installation:

1. Apply a continuous ribbon of sealant or tape to seal lapped joints of metal panels, using sealant or tape as recommend by manufacturer on side laps of nesting-type panels; and elsewhere as needed to make panels watertight.
2. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
3. At panel splices, nest panels with minimum 6-inch end lap, sealed with sealant and fastened together by interlocking clamping plates.

- F. Accessory Installation: 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 panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal wall panel manufacturer; or, if not indicated, provide types recommended by metal panel manufacturer.
- G. 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 are permanently watertight.
  - 1. Install exposed flashing and trim that is without 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 achieve waterproof 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 waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

### 3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Water-Spray Test: After installation, test area of assembly as directed by Architect for water penetration according to AAMA 501.2.
- C. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect completed metal wall panel installation, including accessories.
- D. Remove and replace metal wall panels where tests and inspections indicate that they do not comply with specified requirements.
- E. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.
- F. Prepare test and inspection reports.

### 3.5 CLEANING AND PROTECTION

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

- B. After metal panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.
- C. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07 4213

## SECTION 07 5419 - POLYVINYL-CHLORIDE (PVC) ROOFING

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. This Section includes the following:

1. Fully adhered PVC membrane roofing system over insulation.
2. Roof insulation of thicknesses required to achieve R-30 rating unless otherwise noted.
3. Walkway pads to all roof mounted equipment from roof access points
4. 30 year NDL warranty.

B. Roof work shall be constructed to be free of non-draining areas, with positive slope to drain, under all conditions. Acceptance by the manufacturer of such standing water areas, low spots, wrinkles or other conditions that retain water under their existing guidelines shall have no bearing on the Architect or Owner's requirements to accept conditions that are deemed not to be acceptable. Such defects that create areas not suited to free drainage shall be cause for rejection of the installation until corrected.

1. Factory fabricated components may require modification to achieve positive drainage, to comply with specific project requirements for dimensional limitations and slopes to drain.

C. Related Sections include the following:

1. Section 06 1053 "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking.
2. Section 07 2100 "Thermal Insulation" for insulation beneath the roof deck.
3. Section 07 6200 "Sheet Metal Flashing and Trim" for metal roof penetration flashings, flashings, and counterflashings and rain drainage as work of this Section.
4. Section 07 9200 "Joint Sealants."

#### 1.2 DEFINITIONS

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

B. Design Uplift Pressure: The uplift pressure, calculated according to procedures in SPRI's "Wind Load Design Guide for Fully Adhered and Mechanically Fastened Roofing Systems," before multiplication by a safety factor.

#### 1.3 ACTION SUBMITTALS

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

B. LEED Submittals:

1. Product Data for Credit SS 7.2: For roof materials, documentation indicating that roof materials comply with Solar Reflectance Index requirement.
  2. Product Data for Credit IEQ 4.1: For adhesives and sealants used inside the weatherproofing system, documentation including printed statement of VOC content.
- C. 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. Insulation fastening patterns.
  4. Roof sump detail showing coordination with roof drains.
- D. Samples for Verification: For the following products:
1. 12-by-12-inch square of sheet roofing, of color specified, including T-shaped side and end lap seam.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Installer Certificates: Signed by roofing system manufacturer certifying that Installer is approved, authorized, or licensed by manufacturer to install roofing system.
- B. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.
1. Submit evidence of meeting performance requirements.
- C. Qualification Data: For Installer and manufacturer.
- D. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for components of roofing system.
- E. Research/Evaluation Reports: For components of membrane roofing system.
- F. Inspection Report: Copy of roofing system manufacturer's inspection report of completed roofing installation.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Warranties: Special warranties specified in this Section.
- B. Maintenance Data: For roofing system to include in maintenance manuals.
- C. DFCM Required Roofing Closeout Documents: Require Installer to submit the following documents to project manager at completion of roofing Work. Project manager shall submit

these documents to the roofing program manager. Keep copy of these documents in project file and delivered to agency.

1. DFCM Manufacture Roofing Warranty
2. DFCM 5-year Contractor Warranty – Required on all roofing projects.
3. DFCM Roofing History Record.
4. Roof Warranty Sign – See Roofing Design Requirements for details.

#### 1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's warranty prior to receipt of bids.
  1. A minimum of 15 years experience is required on similar sized projects.
- B. Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.
- C. Source Limitations: Obtain components for membrane roofing system from or approved by roofing membrane manufacturer.
- D. Observation and Documentation: Roofing application is to be observed, a minimum of 2 visits per month, by the roof membrane manufacturer or consultant trained and approved by the membrane manufacturer. Observations are to include documentation of correct installation of the roof assembly.
  1. An employee of the roof installer will not qualify to conduct project monitoring.
  2. Monitoring expenses are to be included in the roof installation cost.
- E. 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.
- F. Preliminary Roofing Conference: Before starting roof deck construction, conduct conference at Project site. Review methods and procedures related to roof deck construction and roofing system including, but not limited to, the following:
  1. Meet with Owner, DFCM Roofing Program Manager, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing including installers of roof accessories and roof-mounted equipment.
  2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
  3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
  4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.

5. Review conditions of sloped deck and tapered insulation to confirm that no flat spots exist in the installation.
6. Review structural loading limitations of roof deck during and after roofing.
7. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
8. Review requirements of existing membrane to maintain warranty in effect at time of work.
9. Review governing regulations and requirements for insurance and certificates if applicable.
10. Review temporary protection requirements for roofing system during and after installation.
11. Review roof observation and repair procedures after roofing installation.

G. Preinstallation Conference: Conduct conference at Project site. Comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to roofing system including, but not limited to, the following:

1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing including installers of roof accessories and roof-mounted equipment.
2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

#### 1.7 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, 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.

## 1.8 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.

## 1.9 WARRANTY

- A. Special Warranty: DFCM standard Single Ply Warranty form, (attached to the end of this section) without NDL monetary limitation, in which manufacturer agrees to repair or replace components of membrane roofing system 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 PERFORMANCE REQUIREMENTS

- A. General: Provide installed roofing membrane and base flashings that remain watertight; do not permit the passage of water; and resist specified uplift pressures, thermally induced movement, and exposure to weather without failure.
- B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by roofing membrane manufacturer based on testing and field experience.
- C. Fire-Test-Response Characteristics: Provide membrane roofing materials with the fire-test-response characteristics indicated as determined by testing identical products per test method below by UL, FMG, or another testing and inspecting agency acceptable to authorities having jurisdiction. Materials shall be identified with appropriate markings of applicable testing and inspecting agency.
  - 1. All products to comply with UL P717 or other 1 hr UL roof assembly pre-approved prior to bid.
  - 2. Exterior Fire-Test Exposure: Class A; ASTM E 108, for application and roof slopes indicated.

3. Fire-Resistance Ratings: ASTM E 119, for fire-resistance-rated roof assemblies of which roofing system is a part.

- D. FMG Listing: Provide roofing membrane, base flashings, and component materials that comply with requirements in FMG 4450 and FMG 4470 as part of a membrane roofing system and that are listed in FMG's "Approval Guide" for Class 1 or noncombustible construction, as applicable. Identify materials with FMG markings.

1. Fire/Windstorm Classification: Class 1A-90.

- E. Solar Reflectance Index: Not less than 78 when calculated according to ASTM E 1980, based on testing identical products by a qualified testing agency.

## 2.2 MANUFACTURES AND INSTALLERS

- A. Consult current DFCM list of approved Manufacturers and Installers.

## 2.3 ROOFING MEMBRANE

- A. PVC Sheet: ASTM D 4434, Type III, liquid coated, acrylic coated, fabric reinforced. Membrane must be manufactured by the company supplying the warranty (no private labeling) with a minimum 20 yr successful track record in the same geographical area.

- B. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work. Only manufacturers that can comply with ALL of the following material performance descriptions will be considered. Manufacturers must be able to prove conformance to the performance criteria on each item or they will be rejected.

1. Thickness: 80 mils, nominal, with a minimum of 46 mils above reinforcing layer and a 30 year membrane warranty
2. Exposed Face Color: White.

## 2.4 AUXILIARY MATERIALS

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

1. Liquid-type auxiliary materials shall meet 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:
  - a. Plastic Foam Adhesives: 50 g/L.
  - b. Gypsum Board and Panel Adhesives: 50 g/L.
  - c. Multipurpose Construction Adhesives: 70 g/L.
  - d. Single-Ply Roof Membrane Adhesives: 250 g/L.
  - e. PVC Welding Compounds: 510 g/L.

- f. Adhesive Primer for Plastic: 650 g/L
  - g. Single-Ply Roof Membrane Sealants: 450 g/L.
  - h. Nonmembrane Roof Sealants: 300 g/L.
  - i. Sealant Primers for Nonporous Substrates: 250 g/L.
  - j. Sealant Primers for Porous Substrates: 775 g/L.
  - k. Other Adhesives and Sealants: 250 g/L.
- B. Sheet Flashing: Manufacturer's standard sheet flashing of same material, type, reinforcement, , and color as sheet membrane.
- 1. Thickness may only be modified as required to turn 90 degree corners with membrane without crazing or cracking the face of the membrane
- C. Bonding Adhesive: Manufacturer's standard bonding adhesive for membrane, and solvent-based bonding adhesive for base flashings.
- D. Metal Termination Bars: Manufacturer's standard predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch thick; with anchors.
- E. Metal Battens: Manufacturer's standard aluminum-zinc-alloy-coated or zinc-coated steel sheet, approximately 1 inch wide by 0.05 inch thick, prepunched.
- F. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening membrane to substrate, and acceptable to membrane roofing system manufacturer.
- G. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, termination reglets, cover strips, and other accessories.

## 2.5 ROOF INSULATION

- A. General: Provide preformed roof insulation boards that comply with requirements and referenced standards, selected from manufacturer's standard sizes and of thicknesses indicated.
- B. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, felt or glass-fiber mat facer on both major surfaces.
- 1. Available Manufacturers include the following:
    - a. Atlas Roofing Corporation.
    - b. Carlisle SynTec Incorporated.
    - c. Firestone Building Products Company.
    - d. Hunter Panels, LLC.
    - e. Johns Manville International, Inc.
- C. Tapered Insulation: Provide factory-tapered insulation boards fabricated to a minimum slope of 3/8 inch per 12 inches. EPS is NOT permitted in sloped applications.

- D. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes at double the slope of main field of roof, where indicated for sloping to drain. Fabricate to slopes indicated.

## 2.6 INSULATION ACCESSORIES

- A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatible with membrane roofing.
- B. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening roof insulation to substrate, and acceptable to roofing system manufacturer.
- C. Insulation Adhesive: Insulation manufacturer's recommended cold-applied adhesive formulated to attach roof insulation to substrate or to another insulation layer.
- D. Protection Mat: Woven or nonwoven polypropylene, polyolefin, or polyester fabric, water permeable and resistant to UV degradation, type and weight as recommended by roofing system manufacturer for application.
- E. Slip Sheet: Manufacturer's recommended slip sheet, of type required for application to separate membrane from insulating substrate

## 2.7 WALKWAYS

- A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, slip-resisting, open-grid, surface-textured, flexible PVC walkway mat, approximately 9/16 inch thick, and acceptable to membrane roofing system manufacturer. To be installed from roof access points to all roof mounted equipment, surrounding each roof mounted component and routed between all pieces of roof mounted equipment.
  - 1. Color: Gray.
  - 2. Size: 24 x 24 squares or 3 foot wide by 33 feet long rolls.
  - 3. Design Standard: Design Standards are used to establish a level of quality for the work. Premium products equal in quality of acceptable manufacturers may be used. The use of a Design Standard is not to be construed as a limit of competition or a constraint of trade.
    - a. Sarnafil Crossgrip Walkway Mat.
    - b. Carlisle ECO NOVA

### 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 set and braced and that roof drains are securely clamped in place.
  - 2. Verify that pressure treated 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 comply with requirements in Division 5 Section "Steel Deck."
  - 4. Verify that membrane shows no signs of abrasion, discoloration, or defects.
  - 5. 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.
- D. Employ roofer for repairing existing roof membrane as approved by the manufacturer, where warranties are still in effect for the existing assembly.

#### 3.3 VAPOR-RETARDER INSTALLATION

- A. Self Adhering Sheet: Place self adhering sheet in a single layer over area to receive vapor retarder, side lapping each sheet a minimum of 3 inches.
  - 1. Continuously seal side and end laps by rolling with roller to ensure adhesion to substrate
- B. Completely seal vapor retarder at terminations, obstructions, and penetrations to prevent air movement into membrane roofing system.

### 3.4 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 manufacturer's written instructions for installing roof insulation.
- C. Install tapered insulation under area of roofing to conform to slopes indicated.
- D. Install MULTIPLE layers of insulation, joints staggered, under area of roofing to achieve required thickness.
- E. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.
- F. Field trim factory formed units where required to provide slopes in crickets and drains.
- G. 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.
- H. Mechanically Fastened Insulation: Install each layer of insulation and secure to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type. Offset joints between layers.
  - 1. Fasten first layer of insulation to resist uplift pressure at corners, perimeter, and field of roof.
  - 2. Set each subsequent layer of insulation in a solid mopping of hot roofing asphalt, applied within plus or minus 25 deg F of equiviscous temperature.
  - 3. Set each subsequent layer of insulation in adhesive, firmly pressing and maintaining insulation in place.

### 3.5 ADHERED MEMBRANE ROOFING INSTALLATION

- A. Adhere membrane roofing over area to receive roofing and install according to membrane roofing system manufacturer's written instructions.
  - 1. Install sheet according to ASTM D 5036.
- 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 perimeter of roofing.
- F. Apply membrane roofing with side laps shingled with slope of roof deck where possible.
- G. Seams: Clean seam areas, overlap membrane roofing, and hot-air weld side and end laps of membrane roofing and sheet flashings according to manufacturer's written instructions to ensure a watertight seam installation.
  - 1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of sheet membrane.
  - 2. Verify field strength of seams a minimum of twice daily and repair seam sample areas.
  - 3. Repair tears, voids, and lapped seams in roofing that does not comply with requirements.
- H. Roof Drains: Completely prime the lead drain flashing and allow to dry prior to installation. Set 36-by-36-inch 4# lead flashing in bed of asphalt roofing cement or approved adhesive. Cover metal flashing with a second ply of roofing membrane and extend a minimum of 6 inches beyond edge of metal flashing onto field of single ply roofing membrane. Terminate the second ply to extend beneath the clamping ring of the drain. Clamp roofing membrane, metal flashing, and second ply into roof-drain clamping ring.
  - 1. Install stripping according to roofing system manufacturer's written instructions.

### 3.6 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 bonding adhesive to seam area of flashing.
- C. Flash penetrations and field-formed inside and outside corners with sheet flashing.
- D. Clean seam areas and overlap and firmly roll sheet flashings into the adhesive. Weld side and end laps to ensure a watertight seam installation.
- E. Extend sheet flashings up and over parapet caps and secure to continuous nailer. Provide transitions at horizontal to vertical to support membrane and avoid any line that could craze or crack under foot traffic at the parapet
- F. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.7 WALKWAY MAT INSTALLATION

- A. Flexible Walkway Mats: Install walkway mat products in locations indicated, from hatches to roof-top mounted equipment. Secure to roofing membrane according to roofing system and walkway mat manufacturers' written instructions.

3.8 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform roof tests and inspections and to prepare test reports.
- B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion and submit report to Architect.
  - 1. Notify Architect or Owner 48 hours in advance of date and time of inspection.
- C. Repair or remove and replace components of membrane roofing system where test results or inspections indicate that they do not comply with specified requirements.
- D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.9 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 07 5419



## WARRANTY FOR SINGLE PLY ROOFING

WHERE AS, \_\_\_\_\_ (manufacture name), a corporation whose address is,

\_\_\_\_\_

hereinafter called the Manufacturer, has manufactured and sold and caused to have applied, pursuant to the specifications and inspection, the necessary roofing materials to construct a PVC, TPO, EPDM or other single ply roof of approximately \_\_\_\_\_ square feet and associated roof flashing of approximately \_\_\_\_\_ linear feet on the building described below:

OWNER: STATE OF UTAH

DFCM PROJECT NO: \_\_\_\_\_

BUILDING NAME : \_\_\_\_\_

LOCATION: \_\_\_\_\_

DATE OF ACCEPTANCE OF ROOFING: \_\_\_\_\_

MANUFACTURE ADDRESS: \_\_\_\_\_

MANUFACTURER'S WARRANTY NO: \_\_\_\_\_

PHONE NUMBER FOR WARRANTY SERVICE: \_\_\_\_\_

ROOFING CONTRACTOR NAME: \_\_\_\_\_

ROOFING CONTRACTOR ADDRESS: \_\_\_\_\_

AND WHEREAS, by careful examination of said roof by the Manufacturer's representative, it has been determined that roofing materials have been applied in conformance with Manufacturer's specifications.

AND WHEREAS, Manufacturer represents and wishes to warranty, subject to the limits stated herein, that its roofing when so applied is effectively watertight for a period of twenty (20) years despite normal wear and tear by the elements, as well as guaranteeing it against defects in workmanship or materials.

NOW THEREFORE, said Manufacturer warranties to the said Owner that, as set forth below, during a period of twenty (20) years from the date of acceptance of said single-ply roofing described above, Manufacturer will at its own expense, make or cause to be made, any repairs that may be necessary, as a result of defects in workmanship or materials supplied by the Manufacturer which results in leaks or of normal wear and tear by the elements which results in leaks, and will maintain said roof in water tight condition free from all leaks arising from such causes. For purposes of this warranty, damage to the roof caused by any unusual natural phenomena shall not be deemed to be "normal wear and tear by the elements".

**INCLUSIONS:** This Warranty does cover, and Manufacturer shall be liable for the following:

- 1 Roofing membrane, membrane flashings, metal flashings, mechanical fastening system, anchors, adhesives, seaming materials, slip sheets, fabrics, insulations, under payments, and accessories furnished by the Manufacturer as incorporated into the roof membrane system.
- 2 Vapor barriers, insulations and / or materials furnished by the Manufacturer or approved to be incorporated into the roof membrane assembly and such damage as may result from failure of these materials.
- 3 Repair of splits, breaks, cracks, and seam failures in membrane system.
- 4 Leaks from failure in material or workmanship.

**EXCLUSIONS:** This Warranty does not cover, and Manufacturer shall not be liable for the following:

- 1 Metal work, including metal counter flashings, not a part of the roof membrane system and such damage as may result from application of these materials;
- 2 Any damage to the roof caused by structural defect in, or failure of, the building or defects in, or failure of, any structural roof deck, or other sheathing materials, used as the base over which the roof and roof insulation is applied;
- 3 Roof damage from special chemical conditions not disclosed to Manufacturer;
- 4 Any damage to the building or contents thereof, except replacement of damaged roof insulation and vapor barrier as noted under "INCLUSION" above;
- 5 Damage due to unauthorized alterations to roofing system.

- 6 Damage to the roof due to mechanical abrasion or abuse not caused by the Manufacturer.
- 7 Damage or failure directly caused by the re-use of existing material. (re-roof)
- 8 Reasonable care and maintenance will be the responsibility of the owner.

**INSPECTION AND REPAIR:** During the term of this Warranty, Manufacturer, its agents or employees, shall have free access to the roof during regular business hours. Upon verbal notice by Owner to Manufacturer within four days of the discovery of any leaks in the roofing system, or need of repair of roof, the Manufacturer shall have ten (10) days to inspect the roof. Following such inspection:

- 1 Manufacturer, at its own expense shall make such repairs as are required by this warranty.
- 2 In case owner or his agent has verbally notified Manufacturer that repairs are required and such repairs are not covered by the Warranty (including repairs required by owner's alteration, extension or addition to the roof) Manufacture, after having obtained Owner's consent thereto, in writing, shall make or cause to be made, such repairs at Owner's expense in accordance with specifications and procedures as established by Manufacturer and this warranty shall thereupon remain in effect for the un-expired portion of its original term. If Owner fails to so consent or if repairs are made by one other than the Manufacturer's authorized designee, this Warranty with respect to such area shall be automatically terminated.
- 3 In the event the (1) Owner notifies Manufacturer and has confirmed the need of repair of roof and (2) Manufacturer is unable to promptly inspect and repair same, and (3) an emergency condition exists which requires prompt repair in order to avoid substantial damage to owner, then owner may make such temporary repairs as may be essential and any such action shall not be a breach of the provision of this Warranty. Owner will bear emergency repair expenses.

**INSPECTION SERVICE:** Manufacturer agrees to re-inspect the completed roof not earlier than 18 nor later than 24 months after completion of the roofing, and if it is determined that there are defects in the roofing, then Manufacturer shall make, or cause to be made at its own expense, such repairs as are necessary to remedy said defects within the scope of its responsibility under the terms of this Warranty.

IN WITNESS WHEREOF, Manufacturer has caused this instrument to be signed and sealed by its duly authorized officer this day of \_\_\_\_\_

BY: \_\_\_\_\_

TITLE: \_\_\_\_\_

CORPORATION: \_\_\_\_\_

SEAL:

Project Manager Approval \_\_\_\_\_

Division of Facilities Construction and Management

Risk I.D. \_\_\_\_\_

## SECTION 07 6200 - SHEET METAL FLASHING AND TRIM

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Formed roof-drainage sheet metal fabrications.
2. Formed low-slope roof sheet metal fabrications.
3. Formed equipment support flashing.

##### B. Related Requirements:

1. Division 04 sections for drip edges at masonry walls.
2. Section 06 1053 "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking.
3. Section 07 2713 "Modified Bituminous Sheet Air Barriers" for flexible flashings behind masonry.
4. Section 07 4213 "Formed Metal Wall Panels" for sheet metal flashing and trim integral with metal wall panels.
5. Section 07 7200 "Roof Accessories" for set-on-type curbs, equipment supports, roof hatches, and other manufactured roof accessory units.

#### 1.2 COORDINATION

- A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.
- B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

#### 1.3 PREINSTALLATION MEETINGS

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

1. Review construction schedule. Verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review special roof details, roof drainage, roof-penetration flashing, equipment curbs, and condition of other construction that affect sheet metal flashing and trim.
3. Review requirements for insurance and certificates if applicable.
4. Review sheet metal flashing observation and repair procedures after flashing installation.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.
- B. LEED Submittals:
  - 1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
- C. Shop Drawings: For sheet metal flashing and trim.
  - 1. Include plans, elevations, sections, and attachment details.
  - 2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work.
  - 3. Include identification of material, thickness, weight, and finish for each item and location in Project.
  - 4. Include details for forming, including profiles, shapes, seams, and dimensions.
  - 5. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
  - 6. Include details of termination points and assemblies.
  - 7. Include details of roof-penetration flashing.
  - 8. Include details of special conditions.
  - 9. Include details of connections to adjoining work.
  - 10. Detail formed flashing and trim at scale of not less than 1-1/2 inches per 12 inches.
- D. Samples for Verification: For each type of exposed finish.
  - 1. Sheet Metal Flashing: 12 inches long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.
  - 2. Trim, Metal Closures, Expansion Joints, Joint Intersections, and Miscellaneous Fabrications: 12 inches long and in required profile. Include fasteners and other exposed accessories.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.
- B. Product Certificates: For each type of coping and roof edge flashing that is FM Approvals approved.
- C. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- D. Sample Warranty: For special warranty.

#### 1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For sheet metal flashing and trim, and its accessories, to include in maintenance manuals.

#### 1.7 QUALITY ASSURANCE

- A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.
  - 1. For copings and roof edge flashings that are FM Approvals approved, shop shall be listed as able to fabricate required details as tested and approved.

#### 1.8 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 extent necessary for period of sheet metal flashing and trim installation.

#### 1.9 WARRANTY

- A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
  - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
    - a. Color fading more than 5 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 PERFORMANCE REQUIREMENTS

- A. General: Sheet metal flashing and trim assemblies 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 Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.
- C. FM Approvals Listing: Manufacture and install copings that are listed in FM Approvals' "RoofNav" and approved for windstorm classification, Class 1-90. Identify materials with name of fabricator and design approved by FM Approvals.
- D. Recycled Content of Steel-Sheet Flashing and Trim: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
  - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

## 2.2 SHEET METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying 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; with smooth, flat surface.
  - 1. Finish: 4 (polished directional satin).
- C. Metallic-Coated Steel Sheet: Provide zinc-coated (galvanized) steel sheet according to ASTM A 653/A 653M, G90 coating designation; prepainted by coil-coating process to comply with ASTM A 755/A 755M.
  - 1. Surface: Smooth, flat.
  - 2. Exposed Coil-Coated Finish:
    - a. Two-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.
  - 3. Color: As selected by Architect from manufacturer's full range.
  - 4. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil.

### 2.3 UNDERLAYMENT MATERIALS

- A. Self-Adhering, High-Temperature Sheet: Minimum 30 mils thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer according to written recommendations of underlayment manufacturer.
1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Grace Construction Products, a unit of W. R. Grace & Co.-Conn.; Grace Ice and Water Shield HT.
    - b. Henry Company; Blueskin PE200 HT.
    - c. Polyguard Products, Inc.; Deck Guard HT.
  2. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F or higher.
  3. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F or lower.
- B. Slip Sheet: Rosin-sized building paper, 3 lb/100 sq. ft. minimum.

### 2.4 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal unless otherwise indicated.
- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal.
1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
    - a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
    - b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
    - c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.
  2. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.
  3. Fasteners for Zinc-Coated (Galvanized) Steel Sheet: Series 300 stainless steel or hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.
- C. Solder:

1. For Stainless Steel: ASTM B 32, Grade Sn60, with acid flux of type recommended by stainless-steel sheet manufacturer.
- D. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.
- E. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- F. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.
- G. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.
- H. Bituminous Coating: Cold-applied asphalt emulsion according to ASTM D 1187.

## 2.5 FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in 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 to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
  4. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners 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 indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
- C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.
  1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
  2. Use lapped expansion joints only where indicated on Drawings.

- D. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.
- E. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard and by FM Global Property Loss Prevention Data Sheet 1-49 for application, but not less than thickness of metal being secured.
- F. Seams: Fabricate nonmoving seams with flat-lock seams. Tin edges of stainless steel to be seamed, form seams, and solder. Form seams of coated galvanized steel and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use.

## 2.6 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

- A. Copings: Fabricate in minimum 96-inch- long, but not exceeding 12-foot- long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and drill elongated holes for fasteners on interior leg. Miter corners, weld watertight. Shop fabricate interior and exterior corners.
  - 1. Coping Profile: As indicated, according to SMACNA's "Architectural Sheet Metal Manual."
  - 2. Joint Style: Butted with expansion space and 6-inch- wide, concealed backup plate.
  - 3. Fabricate from the Following Materials:
    - a. Galvanized Steel: 0.040 inch thick.
- B. Base Flashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:
  - 1. Galvanized Steel: 0.028 inch thick.
- C. Counterflashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:
  - 1. Galvanized Steel: 0.022 inch thick.
- D. Flashing Receivers: Fabricate from the following materials:
  - 1. Galvanized Steel: 0.022 inch thick.
- E. Roof-Penetration Flashing: Fabricate from the following materials:
  - 1. Galvanized Steel: 0.028 inch thick.
- F. Roof-Drain Flashing: Fabricate from the following materials:
  - 1. Stainless Steel: 0.016 inch thick.

## 2.7 WALL SHEET METAL FABRICATIONS

- A. Opening Flashings in Frame Construction: Fabricate head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings. Form head and sill flashing with 2-inch- high, end dams. Fabricate from the following materials:
  - 1. Galvanized Steel: 0.022 inch thick.

## 2.8 MISCELLANEOUS SHEET METAL FABRICATIONS

- A. Equipment Support Flashing: Fabricate from the following materials:
  - 1. Galvanized Steel: 0.028 inch thick.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, substrate, 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.
  - 3. Verify that air-barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 UNDERLAYMENT INSTALLATION

- A. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free. Prime substrate if recommended by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures. Apply in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps and edges with roller. Cover underlayment within 14 days.
- B. Apply slip sheet, wrinkle free, over underlayment before installing sheet metal flashing and trim.

### 3.3 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, 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, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
  2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
  3. Space cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
  4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
  5. Torch cutting of sheet metal flashing and trim is not permitted.
- B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.
1. Coat concealed side of stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
  2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.
1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
  2. Use lapped expansion joints only where indicated on Drawings.
- D. Fastener Sizes: Use fasteners of sizes that will penetrate metal decking not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.
- E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.
- F. Seal joints as required for watertight construction.
1. Use sealant-filled joints unless otherwise indicated. Embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 40 and 70 deg F, set joint

members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.

2. Prepare joints and apply sealants to comply with requirements in Section 07 9200 "Joint Sealants."

G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets with solder to width of 1-1/2 inches; however, reduce pre-tinning where pre-tinned surface would show in completed Work.

1. Do not solder metallic-coated steel sheet.
2. Do not use torches for soldering.
3. Heat surfaces to receive solder, and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.
4. Stainless-Steel Soldering: Tin edges of uncoated sheets, using solder 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.

### 3.4 ROOF-DRAINAGE SYSTEM INSTALLATION

A. General: Install sheet metal roof-drainage items to produce complete roof-drainage system according to cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.

### 3.5 ROOF FLASHING INSTALLATION

A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and cited sheet metal standard. Provide concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.

B. Copings: Anchor to resist uplift and outward forces according to recommendations in FM Global Property Loss Prevention Data Sheet 1-49 for specified FM Approvals' listing for required windstorm classification.

C. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints minimum of 4 inches. Secure in waterproof manner by means of snap-in installation and sealant or lead wedges and sealant unless otherwise indicated.

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

### 3.6 WALL FLASHING INSTALLATION

- A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.
- B. Through-Wall Flashing: Installation of through-wall flashing is specified in Section 07 2713 "Modified Bituminous Sheet Air Barriers." Drip edges are specified in Division 04 masonry sections
- C. Opening Flashings in Frame Construction: Install continuous head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings.

### 3.7 MISCELLANEOUS FLASHING INSTALLATION

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

### 3.8 ERECTION TOLERANCES

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

### 3.9 CLEANING AND PROTECTION

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

END OF SECTION 07 6200

## SECTION 07 7129 - MANUFACTURED ROOF EXPANSION JOINTS

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. This Section includes the following:

1. Metal-flanged, bellows-type roof expansion assemblies.

B. Related Sections include the following:

1. Section 06 1053 "Miscellaneous Rough Carpentry" for wooden curbs for mounting roof expansion assemblies.
2. Section 07 6200 "Sheet Metal Flashing and Trim" for shop- and field-fabricated sheet metal expansion-joint systems, flashing, and other sheet metal items.

#### 1.2 SUBMITTALS

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

B. Shop Drawings: Include plans, elevations, sections, details, joints, splices, locations of joints and splices, intersections, transitions, fittings, and attachments to other work. Where joint assemblies change planes, provide isometric drawings depicting how components interconnect to achieve continuity.

C. Research/Evaluation Reports: For roof expansion assemblies.

D. Warranties: Special warranties specified in this Section.

E. Qualification Data: For Installer.

#### 1.3 QUALITY ASSURANCE

A. Installer Qualifications: Installer of roof membrane.

B. Source Limitations: Obtain metal-flanged, bellows-type roof expansion assemblies approved by roofing membrane manufacturer and that are part of roofing membrane warranty.

C. Product Options: Drawings indicate size, profiles, and dimensional requirements of roof expansion assemblies and are based on the specific system indicated. Refer to Division 01 Section "Product Requirements."

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

D. Fire-Test-Response Characteristics: Provide fire-barrier assemblies with fire-test-response characteristics not less than that of adjacent construction, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Assemblies shall be capable of anticipated movement while maintaining fire rating. Identify assemblies with appropriate markings of applicable testing and inspecting agency.

1. Fire-Resistance Ratings: UL 2079.

#### 1.4 SCHEDULING

A. Coordinate delivery and installation of roof expansion assemblies to prevent damage and provide timely integration of units with roofing membranes and flashing.

#### 1.5 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer and Installer agree to repair or replace roof expansion assemblies that leak, deteriorate in excess of rates specified in manufacturer's published product literature, or otherwise fail to perform within specified warranty period.

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

B. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair or replace components that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Fluoropolymer 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. Warranty Period: 20 years from date of Substantial Completion.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

A. General: Provide roof expansion assemblies that, when installed, remain watertight within movement limitations specified by manufacturer.

## 2.2 METALS

- A. Galvanized Steel Sheet: ASTM A 653/A 653M, hot-dip zinc-coating designation G90, stretcher-leveled standard of flatness and either commercial or forming steel, minimum 0.019 inch thick.

## 2.3 MISCELLANEOUS MATERIALS

- A. Roof Cement: ASTM D 4586, Type II.
- B. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and to remain watertight.
- C. Mineral-Fiber Blanket: ASTM C 665.
- D. Flexible Cellular Sponge or Expanded Rubber: ASTM D 1056.
- E. Silicone Extrusions: Classified according to ASTM D 2000, UV stabilized, and do not propagate flame.
- F. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to withstand design loads.
  - 1. Exposed Penetrating Fasteners: Gasketed screws with hex washer heads matching color of sheet metal.

## 2.4 BELLOWS-TYPE ROOF EXPANSION ASSEMBLIES

- A. Metal-Flanged, Bellows-Type Roof Expansion Assemblies: Provide manufacturer's standard assemblies of sizes and types indicated, with prefabricated units for corner and joint intersections and horizontal and vertical transitions including those to other building expansion joints, splicing units, adhesives, coatings, and other components as recommended by roof expansion assembly manufacturer for complete installation. Fabricate assemblies specifically for roof-to-roof, roof-to-wall, curb-to-curb, or curb-to-wall applications.
- B. Provide assemblies consisting of exposed polymeric sheet over foam bellows, securely anchored at both edges to 3- to 4-inch- wide sheet metal nailing flanges, either flat or angle formed to fit cant or curbs as required. Insulate bellows with closed-cell, flexible rubber or plastic foam not less than 5/16 inch thick; adhere bellows to underside of polymeric sheet.
  - 1. Products:
    - a. Balco Metalines, a division of Balco, Inc.; Type BRBG-CN, BRBG-SN, and BRBG-CSN Roof Bellows.
    - b. C/S Group; Model BRJ and BRJW.
    - c. MM Systems Corporation; Series ERJ, ERJL, ERF, and ERFL.

- d. Watson Bowman Acme Corp.; Model EEJ and EEJ/C.
2. Polymeric Sheet: Manufacturer's standard.
3. Metal Flanges: Zinc-coated (galvanized) steel, minimum 0.019 inch thick.
  - a. Mortar Flanges: Where flanges will be embedded in concrete or mortar, provide manufacturer's standard perforated-metal mortar flanges.
4. Moisture Barrier: Manufacturer's standard, flexible, continuous, polymeric moisture barrier looped under roof expansion assemblies at locations indicated. Fill space with blanket-type, mineral-fiber insulation.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Comply with manufacturer's written instructions for handling and installing roof expansion assemblies and materials unless more stringent requirements are indicated.
- B. Coordinate installation of roof expansion assembly materials and associated work so complete assemblies comply with assembly performance requirements.
- C. Extend roof expansion assemblies over curbs, parapets, fasciae, and other elements in the construction profile, with factory-fabricated intersections and transitions to provide continuous, uninterrupted, waterproof roof expansion assemblies.
  1. Install factory-fabricated transitions between roof expansion assemblies and building architectural joint systems, specified in Division 07 Section "Expansion Control," to provide continuous, uninterrupted, watertight construction.
- D. Splice roof expansion assemblies with materials provided by roof expansion assembly manufacturer for this purpose, according to manufacturer's written instructions, to provide continuous, uninterrupted, waterproof roof expansion assemblies.
- E. Provide uniform profile of roof expansion assembly throughout length of each installation; do not stretch polymeric sheets.
- F. Install mineral-fiber blanket insulation to fill joint space within joint and moisture barrier.
- G. Bed anchorage flanges in cement or sealant recommended by manufacturer and securely nail to curbs and cant strips as recommended by manufacturer but not less than 6 inches o.c.
- H. Anchor roof expansion assemblies complying with manufacturer's written instructions.
- I. On single-ply roofing, install roof expansion assemblies complying with manufacturer's written instructions. Anchor to cants or curbs and seal to membrane with sealant compatible with

roofing membrane and roof expansion assembly. Cover flanges with stripping or flashing and install according to requirements in Section 07 5419 "Polyvinyl-Chloride (PVC) Roofing."

### 3.2 PROTECTION

- A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensures that roof expansion assemblies are without damage or deterioration at time of Substantial Completion.

END OF SECTION 07 7129

## SECTION 07 7200 - ROOF ACCESSORIES

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. Equipment supports.
2. Roof hatches.

B. Related Sections:

1. Section 05 5000 "Metal Fabrications" for metal vertical ladders accessing roof hatches.
2. Section 07 6200 "Sheet Metal Flashing and Trim" for shop- and field-formed metal flashing, roof-drainage systems, and miscellaneous sheet metal trim and accessories.
3. Section 07 7129 "Manufactured Roof Expansion Joints" for manufactured roof expansion-joint covers.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of roof accessory indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Samples: For each exposed product and for each color and texture specified, prepared on Samples of size to adequately show color.

#### 1.3 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Roof plans, drawn to scale, and coordinating penetrations and roof-mounted items. Show the following:
1. Size and location of roof accessories specified in this Section.
  2. Method of attaching roof accessories to roof or building structure.
  3. Other roof-mounted items including mechanical and electrical equipment, ductwork, piping, and conduit.
  4. Required clearances.
- B. Warranty: Sample of special warranty.

#### 1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For roof accessories to include in operation and maintenance manuals.

## 1.5 COORDINATION

- A. Coordinate layout and installation of roof accessories with roofing membrane and base flashing and interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.
- B. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.

## 1.6 WARRANTY

- A. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finishes or replace roof accessories that show evidence of deterioration of factory-applied finishes within specified warranty period.
  - 1. Fluoropolymer 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 PERFORMANCE REQUIREMENTS

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

### 2.2 METAL MATERIALS

- A. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 coating designation.
  - 1. Exposed Coil-Coated Finish: Prepainted by the coil-coating process to comply with ASTM A 755/A 755M. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
    - a. Two-Coat Fluoropolymer Finish: AAMA 621. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight.
  - 2. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester-backer finish consisting of prime coat and wash coat, with a minimum total dry film thickness of 0.5 mil.

- B. Steel Shapes: ASTM A 36/A 36M, hot-dip galvanized according to ASTM A 123/A 123M unless otherwise indicated.
- C. Steel Tube: ASTM A 500, round tube.
- D. Steel Pipe: ASTM A 53/A 53M, galvanized.

## 2.3 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.
- B. Polyisocyanurate Board Insulation: ASTM C 1289, thickness as indicated.
- C. Wood Nailers: Softwood lumber, pressure treated with waterborne preservatives for aboveground use, acceptable to authorities having jurisdiction, containing no arsenic or chromium, and complying with AWPA C2; not less than 1-1/2 inches thick.
- D. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.
- E. Underlayment:
  - 1. Polyethylene Sheet: 6-mil- thick polyethylene sheet complying with ASTM D 4397.
  - 2. Slip Sheet: Building paper, 3-lb/100 sq. ft. minimum, rosin sized.
- F. Fasteners: Roof accessory manufacturer's recommended fasteners suitable for application and metals being fastened. Match finish of exposed fasteners with finish of material being fastened. Provide nonremovable fastener heads to exterior exposed fasteners. Furnish the following unless otherwise indicated:
  - 1. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.
- G. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, PVC, or silicone or a flat design of foam rubber, sponge neoprene, or cork.
- H. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane or silicone polymer sealant as recommended by roof accessory manufacturer for installation indicated; low modulus; of type, grade, class, and use classifications required to seal joints and remain watertight.
- I. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for expansion joints with limited movement.

## 2.4 EQUIPMENT SUPPORTS

- A. Equipment Supports: Internally reinforced metal equipment supports capable of supporting superimposed live and dead loads, including equipment loads and other construction indicated

on Drawings; with welded or mechanically fastened and sealed corner joints, integral metal cant, and integrally formed deck-mounting flange at perimeter bottom.

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

- a. AES Industries, Inc.
- b. Curbs Plus, Inc.
- c. Custom Solution Roof and Metal Products.
- d. Greenheck Fan Corporation.
- e. LM Curbs.
- f. Milcor Inc.; Commercial Products Group of Hart & Cooley, Inc.
- g. Pate Company (The).
- h. Roof Products, Inc.
- i. Thybar Corporation.
- j. Vent Products Co., Inc.

B. Size: Coordinate dimensions with roughing-in information or Shop Drawings of equipment to be supported.

C. Material: Zinc-coated (galvanized) steel sheet, 0.079 inch thick.

1. Finish: Two-coat fluoropolymer.
2. Color: As selected by Architect from manufacturer's full range.

D. Construction:

1. Insulation: Factory insulated with 1-1/2-inch- thick glass-fiber board insulation.
2. Liner: Same material as equipment support, of manufacturer's standard thickness and finish.
3. Factory-installed continuous wood nailers 5-1/2 inches wide at tops of equipment supports.
4. Metal Counterflashing: Manufacturer's standard, removable, fabricated of same metal and finish as equipment support.
5. On ribbed or fluted metal roofs, form deck-mounting flange at perimeter bottom to conform to roof profile.
6. Fabricate equipment supports to minimum height of 12 inches unless otherwise indicated.

## 2.5 ROOF HATCH

A. Roof Hatches: Metal roof-hatch units with lids and insulated single-walled curbs, welded or mechanically fastened and sealed corner joints, continuous lid-to-curb counterflashing and weathertight perimeter gasketing, integral metal cant, and integrally formed deck-mounting flange at perimeter bottom.

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

- a. Babcock-Davis.
  - b. Bilco Company (The).
  - c. Dur-Red Products.
  - d. J. L. Industries, Inc.
  - e. Naturalite Skylight Systems; Vistawall Group (The).
  - f. Nystrom.
  - g. O'Keeffe's Inc.
  - h. Precision Ladders, LLC.
- B. Type and Size: Single-leaf lid, 30 by 36 inches, unless indicated otherwise.
- C. Loads: Minimum 40-lbf/sq. ft. external live load and 20-lbf/sq. ft. internal uplift load.
- D. Hatch Material: Zinc-coated (galvanized) steel sheet, 0.079 inch thick.
1. Finish: Two-coat fluoropolymer.
  2. Color: As selected by Architect from manufacturer's full range.
- E. Construction:
1. Insulation: Polyisocyanurate board.
  2. Hatch Lid: Opaque, insulated, and double walled, with manufacturer's standard metal liner of same material and finish as outer metal lid.
  3. Curb Liner: Manufacturer's standard, of same material and finish as metal curb.
  4. On ribbed or fluted metal roofs, form flange at perimeter bottom to conform to roof profile.
  5. Fabricate curbs to minimum height of 12 inches unless otherwise indicated.
- F. Hardware: Galvanized-steel spring latch with turn handles, butt- or pintle-type hinge system, and padlock hasps inside and outside.
1. Provide two-point latch on lids larger than 84 inches.
- G. Safety Railing System: Roof-hatch manufacturer's standard system including rails, clamps, fasteners, safety barrier at railing opening, and accessories required for a complete installation; attached to roof hatch and complying with 29 CFR 1910.23 requirements and authorities having jurisdiction.
1. Basis of Design Product: Model RHSR-FB as provided by KeeHatch or equivalent safety railing system appropriate for size and orientation of indicated roof hatch
  2. Height: 42 inches above finished roof deck.
  3. Posts and Rails: Galvanized-steel pipe, 1-1/4 inches in diameter or galvanized-steel tube, 1-5/8 inches in diameter.
  4. Maximum Opening Size: System constructed to prevent passage of a sphere 21 inches in diameter.
  5. Post and Rail Tops and Ends: Weather resistant, closed or plugged with prefabricated end fittings.
  6. Provide weep holes or another means to drain entrapped water in hollow sections of handrail and railing members.

7. Fabricate joints exposed to weather to be watertight.
8. Fasteners: Manufacturer's standard, finished to match railing system.
9. Finish: Manufacturer's standard.
  - a. Color: As selected by Architect from manufacturer's full range.

H. Ladder-Assist Post: Roof-hatch manufacturer's standard device for attachment to roof-access ladder.

1. Operation: Post locks in place on full extension; release mechanism returns post to closed position.
2. Height: 42 inches above finished roof deck.
3. Material: Steel tube.
4. Post: 1-5/8-inch- diameter pipe.
5. Finish: Manufacturer's standard baked enamel or powder coat.
  - a. Color: As selected by Architect from manufacturer's full range.

## 2.6 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.
- B. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
- C. Verify dimensions of roof openings for roof accessories.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. General: Install roof accessories according to manufacturer's written instructions.
  1. Install roof accessories level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil canning, buckling, or tool marks.

2. Anchor roof accessories securely in place so they are capable of resisting indicated loads.
  3. Use fasteners, separators, sealants, and other miscellaneous items as required to complete installation of roof accessories and fit them to substrates.
  4. Install roof accessories to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.
- B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
1. Underlayment: Where installing roof accessories directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet, or install a course of polyethylene sheet.
  2. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof accessories for waterproof performance.
- C. Equipment Support Installation: Install equipment supports so top surfaces are level with each other.
- D. Roof-Hatch Installation:
1. Install roof hatch so top surface of hatch curb is level.
  2. Verify that roof hatch operates properly. Clean, lubricate, and adjust operating mechanism and hardware.
  3. Attach safety railing system to roof-hatch curb.
  4. Attach ladder-assist post according to manufacturer's written instructions.
- E. Seal joints with elastomeric or butyl sealant as required by roof accessory manufacturer.
- 3.3 REPAIR AND CLEANING
- A. Touch up factory-primed surfaces with compatible primer ready for field painting according to Section 09 9113 "Exterior Painting".
  - B. Clean exposed surfaces according to manufacturer's written instructions.
  - C. Clean off excess sealants.
  - D. Replace roof accessories that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 07 7200

## SECTION 07 8413 - PENETRATION FIRESTOPPING

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. Penetrations in fire-resistance-rated walls.
2. Penetrations in smoke barriers.

B. Related Sections:

1. Section 07 8446 "Fire-Resistive Joint Systems" for joints in or between fire-resistance-rated construction, at exterior curtain-wall/floor intersections, and in smoke barriers.

#### 1.2 ACTION SUBMITTALS

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

B. LEED Submittals:

1. Product Data for Credit IEQ 4.1: For penetration firestopping sealants and sealant primers, documentation including printed statement of VOC content.

C. Product Schedule: For each penetration firestopping system. Include location and design designation of qualified testing and inspecting agency.

1. Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping condition, submit illustration, with modifications marked, approved by penetration firestopping manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

#### 1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Installer Certificates: From Installer indicating penetration firestopping has been installed in compliance with requirements and manufacturer's written recommendations.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for penetration firestopping.

#### 1.4 QUALITY ASSURANCE

- A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."
- B. Installer Qualifications: A firm experienced in installing penetration firestopping similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its penetration firestopping products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.
- C. Fire-Test-Response Characteristics: Penetration firestopping shall comply with the following requirements:
  - 1. Penetration firestopping tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.
  - 2. Penetration firestopping is identical to those tested per testing standard referenced in "Penetration Firestopping" Article. Provide rated systems complying with the following requirements:
    - a. Penetration firestopping products bear classification marking of qualified testing and inspecting agency.
    - b. Classification markings on penetration firestopping correspond to designations listed by the following:
      - 1) UL in its "Fire Resistance Directory."
- D. Preinstallation Conference: Conduct conference at Project site.

#### 1.5 PROJECT CONDITIONS

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

#### 1.6 COORDINATION

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

- C. Notify Owner's testing agency at least seven days in advance of penetration firestopping installations; confirm dates and times on day preceding each series of installations.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturer: Provide products by the following manufacturer pre-approved as a sole source through DFCM:
  - 1. Hilti, Inc.

### 2.2 PENETRATION FIRESTOPPING

- A. Provide penetration firestopping that is produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.
- B. Penetrations in Fire-Resistance-Rated Walls: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
  - 1. Fire-resistance-rated walls include fire walls, fire-barrier walls, smoke-barrier walls, and fire partitions.
  - 2. F-Rating: Not less than the fire-resistance rating of constructions penetrated.
- C. Penetrations in Smoke Barriers: Provide penetration firestopping with ratings determined per UL 1479.
  - 1. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at 0.30-inch wg at both ambient and elevated temperatures.
- D. Exposed Penetration Firestopping: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.
- E. VOC Content: Penetration firestopping sealants and sealant primers shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
  - 1. Sealants: 250 g/L.
  - 2. Sealant Primers for Nonporous Substrates: 250 g/L.
  - 3. Sealant Primers for Porous Substrates: 775 g/L.

- F. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping manufacturer and approved by qualified testing and inspecting agency for firestopping indicated.
1. Permanent forming/damming/backing materials, including the following:
    - a. Slag-wool-fiber or rock-wool-fiber insulation.
    - b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
    - c. Fire-rated form board.
    - d. Fillers for sealants.
  2. Temporary forming materials.
  3. Substrate primers.
  4. Collars.
  5. Steel sleeves.

## 2.3 FILL MATERIALS

- A. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.
- B. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.
- C. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
- D. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized-steel sheet.
- E. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.
- F. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.
- G. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.
- H. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.

- I. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.
- J. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:
  - 1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces, and nonsag formulation for openings in vertical and sloped surfaces, unless indicated firestopping limits use of nonsag grade for both opening conditions.

## 2.4 MIXING

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

## PART 3 - EXECUTION

### 3.1 EXAMINATION

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

### 3.2 PREPARATION

- A. Surface Cleaning: Clean out openings immediately before installing penetration firestopping to comply with manufacturer's written instructions and with the following requirements:
  - 1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping.
  - 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping. Remove loose particles remaining from cleaning operation.
  - 3. Remove laitance and form-release agents from concrete.
- B. Priming: Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

- C. Masking Tape: Use masking tape to prevent penetration firestopping from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing firestopping's seal with substrates.

### 3.3 INSTALLATION

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

### 3.4 IDENTIFICATION

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

### 3.5 FIELD QUALITY CONTROL

- A. Owner will engage a qualified testing agency to perform tests and inspections.

- B. Where deficiencies are found or penetration firestopping is damaged or removed because of testing, repair or replace penetration firestopping to comply with requirements.
- C. Proceed with enclosing penetration firestopping with other construction only after inspection reports are issued and installations comply with requirements.

### 3.6 CLEANING AND PROTECTION

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

### 3.7 PENETRATION FIRESTOPPING SCHEDULE

- A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHEZ.
- B. Firestopping with No Penetrating Items:
  - 1. UL-Classified Systems: C-AJ- W-J- W-L- 0001-0999.
- C. Firestopping for Metallic Pipes, Conduit, or Tubing:
  - 1. UL-Classified Systems: C-AJ- W-J- W-L- 1001-1999.
- D. Firestopping for Nonmetallic Pipe, Conduit, or Tubing:
  - 1. UL-Classified Systems: C-AJ- W-J- W-L- 2001-2999.
- E. Firestopping for Electrical Cables:
  - 1. UL-Classified Systems: C-AJ- W-J- W-L- 3001-3999.
- F. Firestopping for Cable Trays with Electric Cables:
  - 1. UL-Classified Systems: C-AJ- W-J- W-L- 4001-4999.
- G. Firestopping for Insulated Pipes:
  - 1. UL-Classified Systems: C-AJ- W-J- W-L- 5001-5999.
- H. Firestopping for Miscellaneous Electrical Penetrants:

1. UL-Classified Systems: C-AJ- W-L- W-J- 6001-6999.
- I. Firestopping for Miscellaneous Mechanical Penetrants:
  1. UL-Classified Systems: C-AJ- W-J- W-L- 7001-7999.
- J. Firestopping for Groupings of Penetrants:
  1. UL-Classified Systems: C-AJ- W-J- W-L- 8001-8999.

END OF SECTION 07 8413

## SECTION 07 8446 - FIRE-RESISTIVE JOINT SYSTEMS

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. Joints in or between fire-resistance-rated constructions.
2. Joints in smoke barriers.

B. Related Sections:

1. Section 07 8413 "Penetration Firestopping" for penetrations in fire-resistance-rated walls, horizontal assemblies, and smoke barriers.
2. Section 07 9500 "Expansion Control" for fire-resistive architectural joint systems.

#### 1.2 ACTION SUBMITTALS

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

B. LEED Submittal:

1. Product Data for Credit EQ 4.1: For fire-resistive joint systems, including printed statement of VOC content.

C. Product Schedule: For each fire-resistive joint system. Include location and design designation of qualified testing agency.

1. Where Project conditions require modification to a qualified testing agency's illustration for a particular fire-resistive joint system condition, submit illustration, with modifications marked, approved by fire-resistive joint system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

#### 1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Installer Certificates: From Installer indicating fire-resistive joint systems have been installed in compliance with requirements and manufacturer's written recommendations.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for fire-resistive joint systems.

#### 1.4 QUALITY ASSURANCE

- A. **Installer Qualifications:** A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with UL's "Qualified Firestop Contractor Program Requirements."
- B. **Fire-Test-Response Characteristics:** Fire-resistive joint systems shall comply with the following requirements:
  - 1. Fire-resistive joint system tests are performed by UL or a qualified testing agency acceptable to authorities having jurisdiction.
- C. **Preinstallation Conference:** Conduct conference at Project site.

#### 1.5 PROJECT CONDITIONS

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

#### 1.6 COORDINATION

- A. **Coordinate construction of joints to ensure that fire-resistive joint systems are installed according to specified requirements.**
- B. **Coordinate sizing of joints to accommodate fire-resistive joint systems.**
- C. **Notify Owner's testing agency at least seven days in advance of fire-resistive joint system installations; confirm dates and times on day preceding each series of installations.**

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. **Manufacturer:** Provide products by the following manufacturer pre-approved as a sole source through DFCM:
  - 1. Hilti, Inc.

## 2.2 FIRE-RESISTIVE JOINT SYSTEMS

- A. Where required, provide fire-resistive joint systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which fire-resistive joint systems are installed. Fire-resistive joint systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases.
- B. Joints in or between Fire-Resistance-Rated Construction: Ratings determined per ASTM E 1966 or UL 2079:
  - 1. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of construction they will join.
- C. Joints in Smoke Barriers: Ratings determined per UL 2079.
  - 1. L-Rating: Not exceeding 5.0 cfm/ft of joint at 0.30 inch wg at both ambient and elevated temperatures.
- D. Exposed Fire-Resistive Joint Systems: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.
- E. VOC Content: Provide fire-resistive joint systems that 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.
- F. Accessories: Provide components of fire-resistive joint systems, including primers and forming materials, that are needed to install fill materials and to maintain ratings required. Use only components specified by fire-resistive joint system manufacturer and approved by the qualified testing agency for systems indicated.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

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

### 3.2 PREPARATION

- A. Surface Cleaning: Clean joints immediately before installing fire-resistive joint systems to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:
  - 1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of fill materials.
  - 2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with fill materials. Remove loose particles remaining from cleaning operation.
  - 3. Remove laitance and form-release agents from concrete.
- B. Priming: Prime substrates where recommended in writing by fire-resistive joint system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Masking Tape: Use masking tape to prevent fill materials of fire-resistive joint system from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing fire-resistive joint system's seal with substrates.

### 3.3 INSTALLATION

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

### 3.4 IDENTIFICATION

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

### 3.5 FIELD QUALITY CONTROL

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

### 3.6 CLEANING AND PROTECTING

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

### 3.7 FIRE-RESISTIVE JOINT SYSTEM SCHEDULE

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

- B. General: In compliance with UL classified systems, provide fire-rated joint system product best suited for each condition as per recommendations of fire-resistive joint product manufacturer and as required by code. Obtain Architect's approval for all selections.
  
- C. Head-of-Wall, Fire-Resistive Joint Systems:
  - 1. UL-Classified Systems: HW-D- 0000-0999 for joints less than 2 inches or 1000-1999 for joints between 2 inches and 6 inches wide, as joint width is verified in field.
  - 2. Assembly Rating: 1 hour or 2 hour as indicated.
  - 3. Nominal Joint Width: As indicated.

END OF SECTION 07 8446

## SECTION 07 9200 - JOINT SEALANTS

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

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

##### B. Related Sections:

1. Division 04 sections for masonry control and expansion joint fillers and gaskets.
2. Section 07 9500 "Expansion Control" for building expansion joints.
3. Division 07 Section "Fire-Resistive Joint Systems" for sealing joints in fire-resistance-rated construction.
4. Section 08 4423 "Structural-Sealant-Glazed Curtain Walls" for structural and other glazing sealants.
5. Section 08 8000 "Glazing" for glazing sealants.
6. Section 09 2900 "Gypsum Board" for sealing perimeter joints.
7. Section 09 3000 "Tiling" for sealing tile joints.
8. Section 09 5113 "Acoustical Panel Ceilings" for sealing edge moldings at perimeters with acoustical sealant.

#### 1.2 PRECONSTRUCTION TESTING

##### A. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.

1. Use ASTM C 1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
2. Submit not fewer than eight pieces of each kind of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.
5. Testing will not be required if joint-sealant manufacturers submit joint preparation data that are based on previous testing, not older than 24 months, of sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.

- B. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates as follows:
1. Locate test joints where indicated on Project or, if not indicated, as directed by Architect.
  2. Conduct field tests for each application indicated below:
    - a. Each kind of sealant and joint substrate indicated.
  3. Notify Architect seven days in advance of dates and times when test joints will be erected.
  4. Arrange for tests to take place with joint-sealant manufacturer's technical representative present.
    - a. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.
      - 1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
  5. Report whether sealant failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
  6. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

### 1.3 ACTION SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- B. LEED Submittals:
1. Product Data for Credit IEQ 4.1: For sealants and sealant primers used inside the weatherproofing system, documentation including printed statement of VOC content.
- C. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- D. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- wide joints formed between two 6-inch- long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- E. 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. Qualification Data: For qualified Installer and testing agency.
- B. Product Certificates: For each kind of joint sealant and accessory, from manufacturer.
- C. Sealant, Waterproofing, and Restoration Institute (SWRI) Validation Certificate: For each sealant specified to be validated by SWRI's Sealant Validation Program.
- D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that sealants comply with requirements.
- E. Preconstruction Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:
  1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
  2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
- F. Preconstruction Field-Adhesion Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified in "Preconstruction Testing" Article.
- G. Field-Adhesion Test Reports: For each sealant application tested.
- H. Warranties: Sample of special warranties.

#### 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project and who has a minimum of 5 years experience specializing in installing sealants.
- B. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.
- C. Product Testing: Test joint sealants using a qualified testing agency.
  1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

2. Test according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C 920 for adhesion and cohesion under cyclic movement, adhesion-in-peel, and indentation hardness.

D. Mockups: 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.

E. Preinstallation Conference: Conduct conference at Project site.

#### 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. Special 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: Twenty years for silicones and 5 years for urethanes, 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 PERFORMANCE REQUIREMENTS

- A. Provide elastomeric joint sealants that have been produced and installed to establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates or adjoining materials.
- B. Provide joint sealants for interior applications that have been produced and installed to establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates or adjoining materials.
- C. Provide tamper-resistant sealants in all in-patient areas, including, but not limited to, seclusion rooms, seclusion toilet rooms, seclusion ante rooms, time-out rooms, patient rooms, patient toilet rooms, quiet activity rooms, day rooms, comfort rooms, and direct observation rooms.

### 2.2 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: 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. Liquid-Applied Joint Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
- D. Stain-Test-Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
- E. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.
- F. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

### 2.3 SILICONE JOINT SEALANTS

- A. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.
1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Dow Corning Corporation; 795.
    - b. GE Advanced Materials - Silicones; UltraGlaze SSG4000.
    - c. Tremco Incorporated; Tremsil 600.
- B. Single-Component, Nonsag, Acid-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.
1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Dow Corning Corporation; 999-A.
    - b. GE Advanced Materials - Silicones; Construction SCS1200.
    - c. Pecora Corporation; 863.
    - d. Tremco Incorporated; Tremsil 300.
- C. 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, provide one of the following:
    - a. BASF Building Systems; Omniplus.
    - b. Dow Corning Corporation; 786 Mildew Resistant.
    - c. GE Advanced Materials - Silicones; Sanitary SCS1700.
    - d. Tremco Incorporated; Tremsil 200 Sanitary.

### 2.4 URETHANE JOINT SEALANTS

- A. Multicomponent, Nonsag, Urethane Joint Sealant: ASTM C 920, Type M, Grade NS, Class 25, for Use NT.
1. Products: Subject to compliance with requirements, provide one of the following:
    - a. BASF Building Systems; Sonolastic NP 2.
    - b. Pecora Corporation; Dynatred.
    - c. Sika Corporation, Construction Products Division; Sikaflex - 2c NS.
    - d. Tremco Incorporated; Vulkem 227.
- B. Multicomponent, Nonsag, Traffic-Grade, Urethane Joint Sealant: ASTM C 920, Type M, Grade NS, Class 25, for Use T.
1. Products: Subject to compliance with requirements, provide one of the following:

- a. BASF Building Systems; Sonolastic NP 2.
- b. Pecora Corporation; Dynatred.
- c. Sika Corporation, Construction Products Division; Sikaflex - 2c NS.
- d. Tremco Incorporated; Vulkem 227.

## 2.5 LATEX JOINT SEALANTS

- A. Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.
  1. Products: Subject to compliance with requirements, provide one of the following:
    - a. BASF Building Systems; Sonolac.
    - b. Pecora Corporation; AC-20+.
    - c. Tremco Incorporated; Tremflex 834.

## 2.6 ACOUSTICAL JOINT SEALANTS

- A. 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, provide one of the following:
    - a. Pecora Corporation; AC-20 FTR.
    - b. USG Corporation; SHEETROCK Acoustical Sealant.

## 2.7 SECURITY JOINT SEALANTS

- A. General: Use where indicated on drawings and at exposed interior locations in Patient Rooms, Patient Restrooms, and Seclusion rooms. Apply security sealants at joints that a patient could use to attach a ligature (i.e., around plumbing fixtures, mirrors, picture frames if designed appropriately, some toilet accessories, etc.) Substitutions for products indicated below must be approved in writing by Architect prior to bidding.
- B. Available Products: Subject to compliance with requirements, security joint sealants that may be incorporated in the Work include, but are not limited to, the following:
  1. Tamperproof Security Joint Sealant Designation:
    - a. Security Sealant (tamper-resistant):
    - b. Products:
      - 1) EUCO #452-P; Euclid Chemical Company, The
      - 2) Sikaflex-2c NS; Sika Corporation

- 3) DynaFlex SC; Pecora Corporation
- 4) Scotch-Seal 1252; 3M

## 2.8 JOINT FILLERS FOR CONCRETE PAVING

- A. General: Provide joint fillers of thicknesses and widths indicated.
- B. Bituminous Fiber Joint Filler: Preformed strips of composition below, complying with ASTM D 1751:
  1. Asphalt saturated fiberboard.

## 2.9 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.

## 2.10 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.
  - 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.
- G. Acoustical Sealant Installation: At sound-rated assemblies and elsewhere as indicated, seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations.

### 3.4 FIELD QUALITY CONTROL

- A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:
1. Extent of Testing: Test completed and cured sealant joints as follows:
    - a. Perform 10 tests for the first 1000 feet of joint length for each kind of sealant and joint substrate.
    - b. Perform 1 test for each 1000 feet of joint length thereafter or 1 test per each floor per elevation.
  2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.
    - a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
  3. Inspect tested joints and report on the following:
    - a. Whether sealants filled joint cavities and are free of voids.
    - b. Whether sealant dimensions and configurations comply with specified requirements.
    - c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.
  4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.
  5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.
- B. Evaluation of Field-Adhesion Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

### 3.5 CLEANING

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

### 3.6 PROTECTION

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

### 3.7 JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces JS-1.
  - 1. Joint Locations:
    - a. Isolation and contraction joints in cast-in-place concrete slabs.
    - b. Other joints as indicated.
  - 2. Urethane Joint Sealant: Multicomponent, nonsag, traffic grade, Class 25.
  - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- B. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces JS-2.
  - 1. Joint Locations:
    - a. Construction joints in cast-in-place concrete.
    - b. Control and expansion joints in unit masonry.
    - c. Joints between metal panels.
    - d. Joints between different materials listed above.
    - e. Perimeter joints between materials listed above and frames of doors, windows, and louvers.
    - f. Control and expansion joints in overhead surfaces.
    - g. Other joints as indicated.
  - 2. Silicone Joint Sealant: Single component, nonsag, neutral curing and Class 25 Single component, nonsag, acid curing.
  - 3. Urethane Joint Sealant: Multicomponent, nonsag, Class 25.
  - 4. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- C. Joint-Sealant Application: Interior joints in horizontal traffic surfaces JS-3.
  - 1. Joint Locations:
    - a. Isolation joints in cast-in-place concrete slabs.
    - b. Control and expansion joints in tile flooring.
    - c. Other joints as indicated.
  - 2. Urethane Joint Sealant: Multicomponent, nonsag, traffic grade, Class 25.

3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- D. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces JS-4.
1. Joint Sealant Location:
    - a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
    - b. Tile control and expansion joints where indicated.
    - c. Other joints as indicated.
  2. Joint Sealant: Single component, nonsag, mildew resistant, acid curing.
  3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- E. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces where silicone or urethane sealants are not otherwise indicated and movement capacity and weathering characteristics are not critical JS-5.
1. Joint Locations:
    - a. Control and expansion joints on exposed interior surfaces of exterior walls.
    - b. Tile control and expansion joints.
    - c. Vertical joints on exposed surfaces of interior unit masonry, concrete walls, and partitions.
    - d. Perimeter joints between interior wall surfaces and frames of interior doors and windows.
    - e. Other exposed interior joints as indicated.
  2. Joint Sealant: Latex based.
  3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- F. Joint-Sealant Application: Interior acoustical joints in vertical surfaces and horizontal nontraffic surfaces JS-6.
1. Joint Location:
    - a. Acoustical joints where indicated.
    - b. Other joints as indicated.
  2. Joint Sealant: Acoustical.
  3. Joint-Sealant Color: As selected by Architect from manufacturer's full range.
- G. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces where tamperproof security sealants are indicated and movement capacity and weathering characteristics are not critical JS-7.
1. Joint Locations:

- a. Control and expansion joints on exposed interior surfaces accessed by unsupervised patients.
2. Joint Sealant: Tamperproof sealants.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

END OF SECTION 07 9200

## SECTION 07 9500 - EXPANSION CONTROL

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. Interior expansion control systems.
2. Exterior wall expansion control systems.

B. Related Requirements:

1. Section 07 7129 "Manufactured Roof Expansion Joints" for factory-fabricated roof expansion control.
2. Section 07 8446 "Fire-Resistive Joint Systems" for liquid-applied joint sealants in fire-resistive building joints.
3. Section 07 9200 "Joint Sealants" for liquid-applied joint sealants and for elastomeric sealants without metal frames.

#### 1.2 ACTION SUBMITTALS

A. Shop Drawings: For each expansion control system specified. Include plans, elevations, sections, details, splices, blockout requirement, attachments to other work, and line diagrams showing entire route of each expansion control system. Where expansion control systems change planes, provide isometric or clearly detailed drawing depicting how components interconnect.

B. Samples for Initial Selection: For each type of expansion control system indicated.

1. Include manufacturer's color charts showing the full range of colors and finishes available for each exposed metal and elastomeric seal material.

C. Samples for Verification: For each type of expansion control system indicated, full width by 6 inches long in size.

D. Product Schedule: Prepared by or under the supervision of the supplier. Include the following information in tabular form:

1. Manufacturer and model number for each expansion control system.
2. Expansion control system location cross-referenced to Drawings.
3. Nominal joint width.
4. Movement capability.
5. Classification as thermal or seismic.
6. Materials, colors, and finishes.

7. Product options.

### 1.3 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each fire barrier provided as part of an expansion control system, for tests performed by a qualified testing agency.

## PART 2 - PRODUCTS

### 2.1 SYSTEM DESCRIPTION

- A. General: Provide expansion control systems of design, basic profile, materials, and operation indicated. Provide units with capability to accommodate variations in adjacent surfaces.
  1. Furnish units in longest practicable lengths to minimize field splicing. Install with hairline mitered corners where expansion control systems change direction or abut other materials.
  2. Include factory-fabricated closure materials and transition pieces, T-joints, corners, curbs, cross-connections, and other accessories as required to provide continuous expansion control systems.
- B. Coordination: Coordinate installation of exterior wall expansion control systems with roof expansion control systems to ensure that wall transitions are watertight. Roof expansion joint assemblies are specified elsewhere.

### 2.2 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Expansion control systems shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
  1. The term "withstand" means "the system will remain in place without separation of any parts when subjected to the seismic forces specified."
  2. Component Importance Factor is as indicated in structural notes.

### 2.3 INTERIOR EXPANSION CONTROL SYSTEMS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. Architectural Art Mfg., Inc.; Division of Pittcon Industries.
  2. Construction Specialties, Inc.
  3. JointMaster/InPro Corporation.
  4. MM Systems Corporation.
  5. Nystrom, Inc.

6. Watson Bowman Acme Corp.; a BASF Construction Chemicals business.
- B. Source Limitations: Obtain expansion control systems from single source from single manufacturer.
- C. Wall-to-Wall and Ceiling to Ceiling:
  1. Design Criteria:
    - a. Nominal Joint Width: As indicated on Drawings.
    - b. Movement Capability: -25 percent/+75 percent.
    - c. Type of Movement: Seismic.
  2. Type: Flat seal.
    - a. Metal: Aluminum.
      - 1) Finish: Manufacturer's standard.
    - b. Seal Material: Manufacturer's standard.
      - 1) Color: As selected by Architect from manufacturer's full range.

#### 2.4 EXTERIOR WALL EXPANSION CONTROL SYSTEMS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated or a comparable product, approved in writing by Architect prior to bidding, by one of the following:
  1. Balco, Inc.
  2. Construction Specialties, Inc.
  3. EMSEAL Corporation.
  4. LymTal International, Inc.
  5. Nystrom, Inc.
  6. Williams Products, Inc.
- B. Source Limitations: Obtain expansion control systems from single source from single manufacturer.
- C. Wall-to-Wall:
  1. Basis-of-Design Product: Seismic Colorseal, as provided by Emseal Corp.
  2. Design Criteria:
    - a. Nominal Joint Width: As indicated on Drawings.
    - b. Movement Capability: -50 percent/+50 percent.
    - c. Type of Movement: Seismic.
    - d. Depth of seal: As recommended by manufacturer.

3. Type: Preformed cellular foam.
  - a. Foam Material: Manufacturer's standard with cured low-modulus silicone face.
    - 1) Color: As selected by Architect from manufacturer's full range.

## 2.5 ACCESSORIES

- A. Moisture Barriers: Manufacturer's standard moisture barrier consisting of a continuous, waterproof membrane within joint and attached to substrate on sides of joint below the primary cover. Equip moisture barrier with drain tubes and seals to direct collected moisture to exterior-wall expansion control system.

## 2.6 MATERIALS

- A. Aluminum: ASTM B 221, Alloy 6063-T5 for extrusions; ASTM B 209, Alloy 6061-T6 for sheet and plate.
  1. Apply manufacturer's standard protective coating on aluminum surfaces to be placed in contact with cementitious materials.
- B. Elastomeric Seals: ASTM E 1783; preformed elastomeric membranes or extrusions to be installed in metal frames.
- C. Cellular Foam Seals: Extruded, compressible foam designed to function under compression.
- D. Moisture Barrier: Flexible elastomeric material, EPDM, minimum 45 mils thick or Santoprene.
- E. Accessories: Manufacturer's standard anchors, clips, fasteners, set screws, spacers, and other accessories compatible with material in contact, as indicated or required for complete installations.

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

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine surfaces where expansion control systems will be installed for installation tolerances and other conditions affecting performance of work.
  - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. Prepare substrates according to expansion control system manufacturer's written instructions.
- B. Coordinate and furnish anchorages, setting drawings, and instructions for installing expansion control systems. Provide fasteners of metal, type, and size to suit type of construction indicated and to provide for secure attachment of expansion control systems.

#### 3.3 INSTALLATION

- A. Comply with manufacturer's written instructions for storing, handling, and installing expansion control systems and materials unless more stringent requirements are indicated.
- B. Metal Frames: Perform cutting, drilling, and fitting required to install expansion control systems.
  - 1. Install in true alignment and proper relationship to joints and adjoining finished surfaces measured from established lines and levels.
  - 2. Adjust for differences between actual structural gap and nominal design gap due to ambient temperature at time of installation. Notify Architect where discrepancies occur that will affect proper expansion control system installation and performance.
  - 3. Cut and fit ends to accommodate thermal expansion and contraction of metal without buckling of frames.
  - 4. Repair or grout blockout as required for continuous frame support using nonmetallic, shrinkage-resistant grout.
  - 5. Install frames in continuous contact with adjacent surfaces.
    - a. Shimming is not permitted.
  - 6. Locate anchors at interval recommended by manufacturer, but not less than 3 inches from each end and not more than 24 inches o.c.
- C. Seals in Metal Frames: Install elastomeric seals and membranes in frames to comply with manufacturer's written instructions. Install with minimum number of end joints.
  - 1. Provide in continuous lengths for straight sections.

2. Seal transitions according to manufacturer's written instructions. Vulcanize or heat-weld field-spliced joints as recommended by manufacturer.
3. Installation: Mechanically lock seals into frames or adhere to frames with adhesive or pressure-sensitive tape as recommended by manufacturer.

D. Foam Seals: Install with adhesive recommended by manufacturer.

E. Terminate exposed ends of expansion control systems with field- or factory-fabricated termination devices.

F. Moisture Barrier: Provide at all exterior joints and where indicated on Drawings. Provide drainage fittings where indicated on Drawings.

### 3.4 PROTECTION

A. Do not remove protective covering until finish work in adjacent areas is complete. When protective covering is removed, clean exposed metal surfaces to comply with manufacturer's written instructions.

B. Protect the installation from damage by work of other Sections. Where necessary due to heavy construction traffic, remove and properly store cover plates or seals and install temporary protection over expansion control systems. Reinstall cover plates or seals prior to Substantial Completion of the Work.

END OF SECTION 07 9500

## SECTION 08 1113 - HOLLOW METAL DOORS AND FRAMES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes hollow-metal work.
- B. Related Requirements:
  - 1. Section 08 7100 "Door Hardware" for door hardware for hollow-metal doors.

#### 1.2 DEFINITIONS

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

#### 1.3 COORDINATION

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

#### 1.4 PREINSTALLATION MEETINGS

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

#### 1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, core descriptions, fire-resistance ratings, and finishes.
- B. LEED Submittals:
  - 1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
- C. Shop Drawings: Include the following:
  - 1. Elevations of each door type.

2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of anchorages, joints, field splices, and connections.
7. Details of accessories.
8. Details of moldings, removable stops, and glazing.
9. Details of conduit and preparations for power, signal, and control systems.

D. Samples for Verification:

1. For each type of exposed finish required, prepared on Samples of not less than 3 by 5 inches.
2. For "Doors" and "Frames" subparagraphs below, prepare Samples approximately 12 by 12 inches to demonstrate compliance with requirements for quality of materials and construction:
  - a. Doors: Show vertical-edge, top, and bottom construction; core construction; and hinge and other applied hardware reinforcement. Include separate section showing glazing if applicable.
  - b. Frames: Show profile, corner joint, floor and wall anchors, and silencers. Include separate section showing fixed hollow-metal panels and glazing if applicable.

E. 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.

1.6 INFORMATIONAL SUBMITTALS

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

1.7 QUALITY ASSURANCE

- A. Mockup Sample Door and Frame Assemblies: Build mockups to verify selections made and to demonstrate functionality and aesthetic effects and set quality standards for fabrication and installation.

1. Build mockup of typical 100 percent complete metal door assemblies, including doors, frames, appropriate door hardware, finishes, appropriate glazing, labels, attachments, and accessories. Provide mockups of each of the following:
  - a. Typical Patient Room door
  - b. Typical Seclusion Room door.
2. Install mock-ups in location in a protected location where they can remain undisturbed throughout construction.

3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Commence fabrication of each door and frame type after attaining approval of pertinent mockup in writing from Architect and Owner.
5. After completion of door and frame installation, deliver all components of doors and hardware to Owner as part of Owner's attic stock.

#### 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow-metal work palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
  1. Provide additional protection to prevent damage to factory-finished units.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow-metal work vertically under cover at Project site with head up. Place on minimum 4-inch- high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. Amweld International, LLC.
  2. Ceco Door Products; an Assa Abloy Group company.
  3. Custom Metal Products.
  4. Deansteel.
  5. Fleming-Baron Door Products.
  6. Mesker Door Inc.
  7. Pioneer Industries, Inc.
  8. Security Metal Products Corp.
  9. Steelcraft; an Ingersoll-Rand company.
- B. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.

## 2.2 REGULATORY REQUIREMENTS

- A. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
  - 1. Smoke- and Draft-Control Assemblies: Provide an assembly with gaskets listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.
- B. Fire-Rated, Borrowed-Light Assemblies: Complying with NFPA 80 and listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9.
- C. Labels and Tags: Where labels or tags are required for doors, install them on top edge of door. Do not install tags on side edges of doors where they could be visible.

## 2.3 INTERIOR DOORS AND FRAMES

- A. Construct interior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Frame Type HM01: Heavy-Duty Doors and Frames: SDI A250.8, Level 2. At locations as indicated on door schedule.
  - 1. Physical Performance: Level B according to SDI A250.4.
  - 2. Doors:
    - a. Type: As indicated in the Door and Frame Schedule.
    - b. Thickness: 1-3/4 inches.
    - c. Face: Uncoated, cold-rolled steel sheet, minimum thickness of 0.042 inch (18 gage).
    - d. Edge Construction: Model 2, Seamless.
    - e. Core: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core at manufacturer's discretion.
  - 3. Frames:
    - a. Materials: Uncoated steel sheet, minimum thickness of 0.053 inch.
    - b. Construction: Full profile welded.
  - 4. Exposed Finish: Prime.
- C. Frame Type HM02: Extra-Heavy-Duty Doors and Frames: SDI A250.8, Level 3. At locations as indicated on door schedule..

1. Physical Performance: Level A according to SDI A250.4.
2. Doors:
  - a. Type: As indicated in the Door and Frame Schedule.
    - 1) Provide doors with sloped tops where indicated.
  - b. Thickness: 1-3/4 inches.
  - c. Face: Uncoated, cold-rolled steel sheet, minimum thickness of 0.053 inch (16 gage).
  - d. Edge Construction: Model 2, Seamless.
  - e. Core: Vertical steel stiffener.
3. Frames:
  - a. Materials: Uncoated, steel sheet, minimum thickness of 0.053 inch.
  - b. Construction: Full profile welded.
4. Exposed Finish: Prime.

D. Frame Type HM03: Maximum-Duty (Enhanced) Doors and Frames: SDI A250.8, Level 4, with enhanced metal thickness. At locations as indicated on door schedule..

1. Physical Performance: Level A according to SDI A250.4.
2. Doors:
  - a. Type: As indicated in the Door and Frame Schedule.
  - b. Thickness: 1-3/4 inches
  - c. Face: Uncoated, cold-rolled steel sheet, minimum thickness of 0.097 inch (12 gage).
  - d. Edge Construction: Model 2, Seamless.
  - e. Core: Vertical steel stiffener.
3. Frames:
  - a. Materials: Uncoated steel sheet, minimum thickness of 0.067 inch (14 gage0.
  - b. Construction: Full profile welded.
4. Exposed Finish: Prime.

## 2.4 EXTERIOR HOLLOW-METAL DOORS AND FRAMES

- A. Construct exterior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Extra-Heavy-Duty Doors and Frames: SDI A250.8, Level 3.

1. Physical Performance: Level A according to SDI A250.4.
2. Doors:
  - a. Type: As indicated in the Door and Frame Schedule.
  - b. Thickness: 1-3/4 inches
  - c. Face: Metallic-coated steel sheet, minimum thickness of 0.053 inch (16 gage), with minimum A40 coating.
  - d. Edge Construction: Model 2, Seamless.
  - e. Core: Polyisocyanurate and vertical steel stiffener.
    - 1) Thermal-Rated Doors: Provide doors fabricated with thermal-resistance value (R-value) of not less than 2.1 deg F x h x sq. ft./Btu when tested according to ASTM C 1363.
3. Frames:
  - a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch (16 gage), with minimum A40 coating.
  - b. Construction: Full profile welded.
4. Exposed Finish: Prime.

## 2.5 FRAME ANCHORS

- A. Jamb Anchors:
  1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch (18 gage) thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
  2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch (18 gage) thick.
  3. Compression Type for Drywall Slip-on Frames: Adjustable compression anchors.
  4. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch-diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.
- B. Floor Anchors: Formed from same material as frames, minimum thickness of 0.042 inch (18 gage), and as follows:
  1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
  2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at finish floor surface.

## 2.6 MATERIALS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- C. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- D. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.
- E. Frame Anchors: ASTM A 879/A 879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.
  - 1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.
- F. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- G. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.
- H. Grout: ASTM C 476, except with a maximum slump of 4 inches, as measured according to ASTM C 143/C 143M.
- I. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
- J. Glazing: Comply with requirements in Section 08 8000 "Glazing."
- K. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

## 2.7 FABRICATION

- A. Fabricate hollow-metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Hollow-Metal Doors:

1. Steel-Stiffened Door Cores: Provide minimum thickness 0.026 inch (22 gage), steel vertical stiffeners of same material as face sheets extending full-door height, with vertical webs spaced not more than 6 inches apart. Spot weld to face sheets no more than 5 inches o.c. Fill spaces between stiffeners with glass- or mineral-fiber insulation.
  2. Fire Door Cores: As required to provide fire-protection[ **and temperature-rise**] ratings indicated.
  3. Vertical Edges for Single-Acting Doors: Bevel edges 1/8 inch in 2 inches.
  4. Top Edge Closures: Close top edges of doors with flush closures of same material as face sheets.
  5. Bottom Edge Closures: Close bottom edges of doors with end closures or channels of same material as face sheets.
  6. Exterior Doors: Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
  7. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.
- C. Hollow-Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
1. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
  2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
  3. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
  4. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor; however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottoms of jambs.
  5. Jamb Anchors: Provide number and spacing of anchors as follows:
    - a. Masonry Type: Locate anchors not more than 16 inches from top and bottom of frame. Space anchors not more than 32 inches o.c., to match coursing, and as follows:
      - 1) Two anchors per jamb up to 60 inches high.
      - 2) Three anchors per jamb from 60 to 90 inches high.
      - 3) Four anchors per jamb plus one additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.
    - b. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
      - 1) Three anchors per jamb up to 60 inches high.
      - 2) Four anchors per jamb from 60 to 90 inches high.

- 3) Five anchors per jamb plus one additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
    - c. Compression Type: Not less than two anchors in each frame.
    - d. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.
  6. Head Anchors: Two anchors per head for frames more than 42 inches wide and mounted in metal-stud partitions.
  7. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
    - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
    - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
  8. Terminated Stops: Terminate stops 6 inches above finish floor with a 90-degree angle cut, and close open end of stop with steel sheet closure. Cover opening in extension of frame with welded-steel filler plate, with welds ground smooth and flush with frame.
- D. Fabricate concealed stiffeners and edge channels from either cold- or hot-rolled steel sheet.
- E. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.
1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
  2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.
- F. Stops and Moldings: Provide stops and moldings around glazed lites and louvers where indicated. Form corners of stops and moldings with mitered hairline joints.
1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow-metal work.
  2. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
  3. Provide loose stops and moldings on inside of hollow-metal work.
  4. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.

## 2.8 LIGHT FRAMES

- A. Security Lite Kits for 1/4-inch Glazing Light Openings: Manufacturer's standard frame formed of 0.038-inch- thick, stainless steel sheet.
1. Basis of Design:

- a. For : **National Guard Products, Inc.; Stainless Steel Lite Kit Model L-CVFM-SS**, or equivalent product approved by Architect prior to bid and complying with requirements from another manufacturer.
  2. Material: 20 gage minimum thickness, stainless steel.
  3. Use Torx security screws.
  4. Corners: Mitered and welded.
  5. Finish: No#4 brushed stainless steel.
- B. Security Lite Kits for 1/2-inch Polycarbonate Glazed Light Openings: Manufacturer's standard frame formed of 0.043-inch- thick, cold-rolled steel sheet.
1. Basis of Design:
    - a. For 1/2-inch glazing: **National Guard Products, Inc.; Stainless Steel Lite Kit Model L-VGLF-PZ**, or equivalent product approved by Architect prior to bid and complying with requirements from another manufacturer.
    2. Material: 18 gage minimum thickness, cold-rolled steel.
    3. Use Torx security screws. No exposed fasteners.
    4. Corners: Mitered and welded.
    5. Finish: Powder coated with gray primer. Field paint.

## 2.9 STEEL FINISHES

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

## 2.10 ACCESSORIES

- A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.
- B. Grout Guards: Formed from same material as frames, not less than 0.016 inch thick.

## 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 doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

### 3.3 INSTALLATION

- A. General: Install hollow-metal work plumb, rigid, properly aligned, and securely fastened in place. Comply with Drawings and manufacturer's written instructions.
- B. Hollow-Metal Frames: Install hollow-metal frames of size and profile indicated. Comply with SDI A250.11 or NAAMM-HMMA 840 as required by standards specified.
  - 1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
    - a. At fire-rated openings, install frames according to NFPA 80.
    - b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
    - c. Install frames with removable stops located on secure side of opening.
    - d. Install door silencers in frames before grouting.
    - e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
    - f. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
    - g. Field apply bituminous coating to backs of frames that will be filled with grout containing antifreezing agents.
  - 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
    - a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
  - 3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation inside frames.

4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
  5. In-Place Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
  6. In-Place Metal Partitions: Secure slip-on drywall frames in place according to manufacturer's written instructions.
  7. Installation Tolerances: Adjust hollow-metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
    - a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
    - b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
    - c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
    - d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.
- C. Hollow-Metal Doors: Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.
1. Non-Fire-Rated Steel Doors:
    - a. Between Door and Frame Jambs and Head: 1/8 inch plus or minus 1/32 inch.
    - b. Between Edges of Pairs of Doors: 1/8 inch to 1/4 inch plus or minus 1/32 inch.
    - c. At Bottom of Door: 3/4 inch plus or minus 1/32 inch.
    - d. Between Door Face and Stop: 1/16 inch to 1/8 inch plus or minus 1/32 inch.
  2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
  3. Smoke-Control Doors: Install doors and gaskets according to NFPA 105.
- D. Glazing: Comply with installation requirements in Section 08 8000 "Glazing" and with hollow-metal manufacturer's written instructions.
1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

### 3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.
- B. Remove grout and other bonding material from hollow-metal work immediately after installation.
- C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

- D. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.
- E. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION 08 1113

## SECTION 08 1416 - FLUSH WOOD DOORS

### PART 1 - GENERAL

#### 1.1 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.

##### B. Related Requirements:

1. Section 08 3473 "Wood Sound Control Door Assemblies" for acoustic flush wood doors.
2. Section 08 8000 "Glazing" for glass view panels in flush wood doors.

#### 1.2 PREINSTALLATION MEETINGS

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

#### 1.3 ACTION SUBMITTALS

- ##### A. Product Data: For each type of door. Include details of core and edge construction and trim for openings. Include factory-finishing specifications.

##### B. LEED Submittals:

1. Product Certificates for Credit MR 5: For products and materials required to comply with requirements for regional materials, certificates indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating distance to Project, cost for each regional material, and fraction by weight that is considered regional.
2. Certificates for Credit MR 7: Chain-of-custody certificates indicating that flush wood doors comply with forest certification requirements. Include documentation that manufacturer is certified for chain of custody by an FSC-accredited certification body. Include statement indicating cost for each certified wood product.
3. Product Data for Credit IEQ 4.4: For adhesives and composite wood products, documentation indicating that product contains no urea formaldehyde.

- ##### C. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; and the following:

1. Dimensions and locations of blocking.
2. Dimensions and locations of mortises and holes for hardware.

3. Dimensions and locations of cutouts.
4. Undercuts.
5. Requirements for veneer matching.
6. Doors to be factory finished and finish requirements.
7. Fire-protection ratings for fire-rated doors.

D. Samples for Initial Selection: For factory-finished doors.

E. Samples for Verification:

1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish. For wood species and transparent finish, provide set of three Samples showing typical range of color and grain to be expected in finished Work.
2. Corner sections of doors, approximately 8 by 10 inches, with door faces and edges representing actual materials to be used.
  - a. Provide Samples for each species of veneer and solid lumber required.
  - b. Provide Samples for each color, texture, and pattern of plastic laminate required.
  - c. Finish veneer-faced door Samples with same materials proposed for factory-finished doors.
3. Frames for light openings, 6 inches long, for each material, type, and finish required.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For special warranty.
- B. Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

#### 1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body and is a certified participant in AWI's Quality Certification Program.
- B. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. 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 top and bottom rail with opening number used on Shop Drawings.

1.7 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 temperature between 60 and 90 deg F and relative humidity between 25 and 55 percent during remainder of construction period.

1.8 WARRANTY

- A. A. Special Warranty: Manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
    - a. Warping (bow, cup, or twist) more than 1/4 inch 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 shall also include installation and finishing that may be required due to repair or replacement of defective doors.
  3. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Algoma Hardwoods, Inc.
  2. Ampco.
  3. Chappell Door Co.
  4. Eggers Industries.
  5. Graham Wood Doors; an Assa Abloy Group company.
  6. Haley Brothers, Inc.
  7. Ipik Door Company.
  8. Lambton Doors.
  9. Marlite.
  10. Marshfield Door Systems, Inc.
  11. Mohawk Doors; a Masonite company.
  12. Oshkosh Door Company.
  13. Poncraft Door Company.
  14. Vancouver Door Company.
  15. 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 AWI's, AWMAC's, and WI's "Architectural Woodwork Standards."
1. Provide AWI Quality Certification Labels indicating that doors comply with requirements of grades specified.
    - a. Apply labels to top edge of door where it will not be readily visible. Do not put labels or tags on side edges of doors or on frames.
  2. Contract Documents contain selections chosen from options in quality standard and additional requirements beyond those of quality standard. Comply with those selections and requirements in addition to quality standard.
- B. Regional Materials: Flush wood doors shall be manufactured within 500 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.
- C. Certified Wood: Flush wood doors shall be certified as "FSC Pure" or "FSC Mixed Credit" according to FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship," and to FSC STD-40-004, "FSC Standard for Chain of Custody Certification."
- D. Low-Emitting Materials: Fabricate doors with adhesives and composite wood products that do not contain urea formaldehyde.
- E. WDMA I.S.1-A Performance Grade:
1. Heavy Duty unless otherwise indicated.
  2. Extra Heavy Duty: Classrooms, public toilets, janitor's closets, assembly spaces, exits, patient rooms, and where indicated.
  3. Standard Duty: Closets (not including janitor's closets) and where indicated.
- F. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
1. Cores: Provide core specified or mineral core as needed to provide fire-protection rating indicated.
  2. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.
  3. Pairs: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.
- G. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control, based on testing according to UL 1784.
- H. Particleboard-Core Doors:

1. Particleboard: ANSI A208.1, Grade LD-2, made with binder containing no urea-formaldehyde.
2. Provide doors with glued-wood-stave or structural-composite-lumber cores instead of particleboard cores for doors indicated to receive exit devices.

I. 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.

2.3 VENEER-FACED DOORS FOR TRANSPARENT FINISH

A. Interior Solid-Core Doors:

1. Grade: Premium (Grade A faces).
2. Species: Select white maple.
3. Cut: Plain sliced (flat sliced).
4. Match between Veneer Leaves: Book match.
5. Assembly of Veneer Leaves on Door Faces: Center-balance match.
6. Pair and Set Match: Provide for doors hung in same opening.
7. Room Match: Match door faces within each separate room or area of building. Corridor-door faces do not need to match where they are separated by 10 feet or more.
8. Exposed Vertical and Top Edges: Same species as faces - edge Type A.
9. Core: Particleboard of sound retardant construction with an STC rating of 41 where required.
10. Construction: Five plies. Stiles and rails are bonded to core, then entire unit is abrasive planed before veneering.
11. WDMA I.S.1-A Performance Grade: As indicated.

2.4 LIGHT FRAMES

A. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads unless otherwise indicated.

1. Wood Species: Same species as door faces.
2. Profile: Recessed tapered beads.
3. At wood-core doors with 20-minute fire-protection ratings, provide wood beads and metal glazing clips approved for such use.

B. Wood-Veneered Beads for Light Openings in Fire-Rated Doors: Manufacturer's standard wood-veneered noncombustible beads matching veneer species of door faces and approved for use in doors of fire-protection rating indicated. Include concealed metal glazing clips where required for opening size and fire-protection rating indicated.

## 2.5 FABRICATION

- A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
  - 1. Comply with NFPA 80 requirements for fire-rated doors.
- 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, BHMA-156.115-W, and hardware templates.
  - 1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
  - 2. Metal Astragals: Factory machine astragals and formed-steel edges for hardware for pairs of fire-rated doors.
- C. Openings: Factory cut and trim openings through doors.
  - 1. Light Openings: Trim openings with moldings of material and profile indicated.
  - 2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Section 08 8000 "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 top and bottom edges, edges of cutouts, and mortises.
- B. Factory finish doors.
- C. Transparent Finish:
  - 1. Grade: Premium.
  - 2. Finish: AWI's, AWMAC's, and WI's "Architectural Woodwork Standards" System 11, catalyzed polyurethane.
  - 3. Staining: Match Architect's sample.
  - 4. Effect: Open-grain finish.
  - 5. Sheen: Satin.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine doors and installed door frames, with Installer present, before hanging doors.
  - 1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
  - 2. Reject doors with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 INSTALLATION

- A. Hardware: For installation, see Section 08 7100 "Door Hardware."
- B. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.
  - 1. Install fire-rated doors according to NFPA 80.
  - 2. Install smoke- and draft-control doors according to NFPA 105.
- 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 08 1416

## SECTION 08 3113 - ACCESS DOORS AND FRAMES

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. Access doors and frames for walls and ceilings.

B. Related Requirements:

1. Section 07 7200 "Roof Accessories" for roof hatches.

#### 1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, fire ratings, materials, individual components and profiles, and finishes.

B. Shop Drawings:

1. Include plans, elevations, sections, details, and attachments to other work.
2. Detail fabrication and installation of access doors and frames for each type of substrate.

C. Samples: For each door face material, at least 3 by 5 inches in size, in specified finish.

D. Product Schedule: Provide complete access door and frame schedule, including types, locations, sizes, latching or locking provisions, and other data pertinent to installation.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

A. Fire-Rated Access Doors and Frames: Units complying with NFPA 80 that are identical to access door and frame assemblies tested for fire-test-response characteristics according to the following test method and that are listed and labeled by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

1. NFPA 252 or UL 10B for fire-rated access door assemblies installed vertically.
2. NFPA 288 for fire-rated access door assemblies installed horizontally.

## 2.2 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Access Panel Solutions.
  2. Acudor Products, Inc.
  3. Alfab, Inc.
  4. Babcock-Davis.
  5. Elmdor/Stoneman Manufacturing Co.; Div. of Acorn Engineering Co.
  6. J. L. Industries, Inc.; Div. of Activar Construction Products Group.
  7. Karp Associates, Inc.
  8. Larsen's Manufacturing Company.
  9. MIFAB, Inc.
  10. Milcor Inc.
  11. Nystrom, Inc.
- B. Source Limitations: Obtain each type of access door and frame from single source from single manufacturer.
- C. Flush Access Doors with Exposed Flanges:
1. Assembly Description: Fabricate door to fit flush to frame. Provide manufacturer's standard-width exposed flange, proportional to door size.
  2. Locations: Walls (and ceilings in pediatric bldg.)
  3. Door Size: As indicated.
  4. Uncoated Steel Sheet for Door: Nominal 0.060 inch, 16 gage.
    - a. Finish: Factory prime.
  5. Frame Material: Same material, thickness, and finish as door.
  6. Hinges: Manufacturer's standard.
  7. Hardware: Lock.
- D. Fire-Rated, Flush Access Doors with Exposed Flanges:
1. Assembly Description: Fabricate door to fit flush to frame, with a core of mineral-fiber insulation enclosed in sheet metal. Provide self-latching door with automatic closer and interior latch release. Provide manufacturer's standard-width exposed flange, proportional to door size.
  2. Locations: Walls (and ceilings in pediatric bldg.)
  3. Fire-Resistance Rating: Not less than that of adjacent construction.
  4. Uncoated Steel Sheet for Door: Nominal 0.036 inch, 20 gage.
    - a. Finish: Factory prime.
  5. Frame Material: Same material, thickness, and finish as door.
  6. Hinges: Manufacturer's standard.
  7. Hardware: Lock.

- E. GFRG Flush Access Security Doors with Concealed Flanges:
1. Basis-of-Design Product: Wind-Lock Products. TT-AP GFRG Stealth Access Panels.
  2. Assembly Description: Fabricate door to fit flush to frame. Provide concealed flange installation.
  3. Locations: **At all gypsum ceilings in Payne bldg.**
  4. Door Size: As indicated
  5. Shell Thickness: 1/8 inch to 3/16 inch thick.
    - a. Finish: Field finish to match surrounding surfaces.
  6. Frame Material: Manufacturer's standard.
  7. Hinges: Manufacturer's standard.
- F. Hardware:
1. Lock: Cylinder.
    - a. Lock Preparation: Prepare door panel to accept cylinder specified in Section 08 7100 "Door Hardware."

## 2.3 MATERIALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Steel Sheet: Uncoated or electrolytic zinc coated, ASTM A 879/A 879M, with cold-rolled steel sheet substrate complying with ASTM A 1008/A 1008M, Commercial Steel (CS), exposed.
- C. Glass-Fiber-Reinforced Gypsum Fabrications: ASTM C 1355/C 1355M.
1. Embedments for GFRG panels: As standard with glass-fiber-reinforced gypsum panel fabrication manufacturer and as required for reinforcement and for anchorage to substrates and framing.
- D. Frame Anchors: Same type as door face.
- E. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

## 2.4 FABRICATION

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

- C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access doors to types of supports indicated.
  - 1. Provide mounting holes in frames for attachment of units to metal framing.
  - 2. Provide mounting holes in frame for attachment of masonry anchors.
- D. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.
  - 1. For cylinder locks, furnish two keys per lock and key all locks alike.

## 2.5 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. Steel Finishes:
  - 1. Factory Prime: Apply manufacturer's standard, fast-curing, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

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

### 3.2 INSTALLATION

- A. Comply with manufacturer's written instructions for installing access doors and frames.
- B. Install doors flush with adjacent finish surfaces or recessed to receive finish material.
- C. Install glass-fiber-reinforced gypsum (GFRG) panels level, plumb, true, and aligned with adjacent materials. Use concealed shims where required for alignment.

1. Attach glass-fiber-reinforced gypsum panels to framing and substrates with steel drill screws. Countersink screw heads below adjoining finished surface.
2. Joint Finishing: Comply with ASTM C 840 for the finish level indicated in Section 09 2900 "Gypsum Board" for adjacent surfaces.

### 3.3 ADJUSTING

- A. Adjust doors and hardware, after installation, for proper operation.
- B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION 08 3113

## SECTION 08 3326 - OVERHEAD COILING GRILLES

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. Manually operated closed-curtain overhead coiling grilles.
2. Motor operated closed-curtain overhead coiling grilles.

B. Related Requirements:

1. Section 05 5000 "Metal Fabrications" for miscellaneous steel supports, angle-framing of grille opening, corner guards, and bollards.

#### 1.2 ACTION SUBMITTALS

A. Product Data: For each type and size of overhead coiling grille and accessory.

1. Include construction details, material descriptions, dimensions of individual components, profiles for curtain components, and finishes.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.

B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.

1. Include plans, elevations, sections, and mounting details.
2. Include details of equipment assemblies. Indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
4. Show locations of locking devices and other accessories.
5. Include diagrams for power, signal, and control wiring.

C. Samples for Initial Selection: Manufacturer's finish charts showing full range of colors and textures available for units with factory-applied finishes.

1. Include similar Samples of accessories involving color selection.

D. Samples for Verification: For each type of exposed finish on the following components, in manufacturer's standard sizes:

1. Closed-curtain grille with full-size components consisting of ribs and infill as required to illustrate each assembly.

2. Bottom bar.
3. Guides.
4. Mounting frame.
5. Brackets.
6. Hood.

### 1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

### 1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For overhead coiling grilles to include in maintenance manuals.

### 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.
- B. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC A117.1.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS, GENERAL

- A. Source Limitations: Obtain overhead coiling grilles from single source from single manufacturer.
  1. Obtain operators and controls from overhead coiling-grille manufacturer.

### 2.2 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Overhead coiling grilles shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
  1. Component Importance Factor: As indicated in Structural Notes.

### 2.3 CLOSED-CURTAIN GRILLE ASSEMBLY

- A. Closed-Curtain Grille: Overhead coiling, countertop grille with a curtain having a series of horizontal ribs alternating with continuous horizontal infill panels secured by the ribs.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. AlumaTek, Inc.
    - b. Dynamic Closures Corp.
- B. Operation Cycles: Grille components and operators capable of operating for not less than 50,000. One operation cycle is complete when a grille is opened from the closed position to the fully open position and returned to the closed position.
- C. Grille Curtain Material: Aluminum ribs with continuous inserts indicated.
  - 1. Rib Spacing: Approximately 3 inches o.c.
- D. Bottom Bar: Continuous tubular shape, fabricated from aluminum extrusion and finished to match grille.
- E. Curtain Jamb Guides: Aluminum with exposed finish matching curtain slats. Provide continuous integral wear strips to prevent metal-to-metal contact and to minimize operational noise.
- F. Hood: Match curtain material and finish Aluminum.
  - 1. Shape: Square, unless indicated otherwise.
  - 2. Mounting: Face of wall.
- G. Locking Devices: Equip grille with locking device assembly.
  - 1. Locking Device Assembly: Cremone type, both jamb sides locking bars, operable from inside and outside with cylinders.
- H. Manual Grille Operator: Push-up operation.
  - 1. Provide operator with through-wall shaft operation.
- I. Electric Grille Operator:
  - 1. Usage Classification: Standard duty, up to 25 cycles per hour and up to 90 cycles per day.
  - 2. Operator Location: As indicated on Drawings.
  - 3. Safety: Listed according to UL 325 by a qualified testing agency for commercial or industrial use; moving parts of operator enclosed or guarded if exposed and mounted at 8 feet or lower.
  - 4. Motor Exposure: Interior.
  - 5. Emergency Manual Operation: Push-up type.

6. Obstruction-Detection Device: Automatic electric sensor edge on bottom bar ; self-monitoring.
  - a. Sensor Edge Bulb Color: As selected by Architect from manufacturer's full range.
7. Control Station: Interior mounted.
8. Other Equipment: Emergency-egress release.

J. Grille Finish:

1. Baked-Enamel Finish: Color as selected by Architect from manufacturer's full range.

2.4 MATERIALS, GENERAL

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.5 GRILLE CURTAIN MATERIALS AND CONSTRUCTION

- A. Closed-Curtain Grilles: Fabricate curtain as a series of horizontal double-C ribs, spaced at regular intervals, that alternate with continuous horizontal infill panels secured by the ribs.
  1. Aluminum Horizontal Ribs: ASTM B 221, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
  2. Aluminum Panels: ASTM B 209, alloy and temper standard with manufacturer for type of use and finish indicated; manufacturer's standard panel dimensions and thickness; finished to match ribs.
- B. Bottom Bar: Manufacturer's standard continuous shape unless otherwise indicated, finished to match grille.
  1. Astragal: Equip grille bottom bar with a replaceable, adjustable, continuous, compressible gasket of flexible vinyl, rubber, or neoprene as a cushion bumper.
  2. Provide motor-operated grilles with combination bottom astragal and sensor edge.
- C. Grille Curtain Jamb Guides: Manufacturer's standard shape having curtain groove with return lips or bars to retain curtain. Provide continuous integral wear strips to prevent metal-to-metal contact and to minimize operational noise; with removable stops on guides to prevent overtravel of curtain.

2.6 HOODS AND ACCESSORIES

- A. General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any

portion of between-jamb mounting that projects beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging.

1. Aluminum: 0.040-inch- thick aluminum sheet, complying with ASTM B 209, of alloy and temper recommended by manufacturer and finisher for type of use and finish indicated.
- B. Mounting Frame: Manufacturer's standard mounting frame designed to support grille; factory fabricated from ASTM A 36/A 36M structural-steel tubes or shapes, hot-dip galvanized per ASTM A 123/A 123M; fastened to floor and structure above grille; to be built into wall construction; and complete with anchors, connections, and fasteners.
- C. Push/Pull Handles: Equip push-up-operated or emergency-operated grille with lifting handles on each side of grille, finished to match grille.

## 2.7 LOCKING DEVICES

- A. Locking Device Assembly: Fabricate with cylinder lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.
  1. Lock Cylinders:
    - a. Manual Grilles: Cylinder locks and keyed to building keying system.
    - b. Electric Grilles: Cylinder locks and keyed to building keying system.
      - 1) Keyed Control Station: Keyed, momentary-contact, switch-operated control station with open and close functions. Provide the following keyswitch for operating electric grilles:
        - a) Keyswitch | 653-04 | 630 | SCE
  2. Keys: Three for each cylinder.
- B. Safety Interlock Switch: Equip power-operated grilles with safety interlock switch to disengage power supply when grille is locked.

## 2.8 COUNTERBALANCING MECHANISM

- A. General: Counterbalance grilles by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.
- B. Counterbalance Barrel: Fabricate spring barrel of manufacturer's standard hot-formed, structural-quality, seamless carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of parts and to limit barrel deflection to not more than 0.03 in./ft. of span under full load.

- C. Counterbalance Spring: One or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Secure ends of springs to barrel and shaft with cast-steel barrel plugs.
- D. Torsion Rod for Counterbalance Shaft: Fabricate of manufacturer's standard cold-rolled steel, sized to hold fixed spring ends and carry torsional load.
- E. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

## 2.9 MANUAL GRILLE OPERATORS

- A. General: Equip grille with manual grille operator by grille manufacturer.
- B. Push-up Grille Operation: Lift handles and pull rope for raising and lowering grille, with counterbalance mechanism designed so that required lift or pull for grille operation does not exceed 25 lbf.

## 2.10 ELECTRIC GRILLE OPERATORS

- A. General: Electric grille operator assembly of size and capacity recommended and provided by grille manufacturer for grille and operation cycles requirement specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, control stations, control devices, integral gearing for locking grille, and accessories required for proper operation.
  - 1. Comply with NFPA 70.
  - 2. Control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24-V ac or dc.
- B. Usage Classification: Electric operator and components capable of operating for not less than number of cycles per hour indicated for each grille.
- C. Grille Operator Location: Operator location indicated for each grille.
  - 1. Front-of-Hood Mounted: Operator is mounted to the right or left grille head plate, with the operator on coil side of the grille-hood assembly and connected to the grille drive shaft with drive chain and sprockets. Front clearance is required for this type of mounting.
- D. Motors: Reversible-type motor with controller (disconnect switch) for motor exposure indicated.
  - 1. Electrical Characteristics:
    - a. Phase: Single phase.
    - b. Hertz: 60.

2. Motor Size: Minimum size as indicated. If not indicated, large enough to start, accelerate, and operate grille in either direction from any position, at a speed not less than 8 in./sec. and not more than 12 in./sec., without exceeding nameplate ratings or service factor.
  3. Operating Controls, Controllers (Disconnect Switches), Wiring Devices, and Wiring: Manufacturer's standard unless otherwise indicated.
  4. Coordinate wiring requirements and electrical characteristics of motors and other electrical devices with building electrical system and each location where installed.
- E. Limit Switches: Equip motorized grille with adjustable switches interlocked with motor controls and set to automatically stop grille at fully opened and fully closed positions.
- F. Obstruction-Detection Device: External entrapment protection consisting of indicated automatic safety sensor capable of protecting full width of grille opening. Activation of sensor immediately stops and reverses downward grille travel.
1. Electric Sensor Edge: Automatic safety sensor edge, located within astragal or weather stripping mounted to bottom bar. Contact with sensor activates device. Connect to control circuit using manufacturer's standard take-up reel or self-coiling cable.
    - a. Self-Monitoring Type: Four-wire configured device designed to interface with grille operator control circuit to detect damage to or disconnection of sensor edge.
- G. Control Station: Three-button control station in fixed location with momentary-contact push-button controls labeled "Open" and "Stop" and sustained- or constant-pressure push-button control labeled "Close."
1. Interior-Mounted Units: Full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.
- H. Emergency Manual Operation: Equip electrically powered grille with capability for emergency manual operation. Design manual mechanism so required force for grille operation does not exceed 25 lbf.
- I. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.
- J. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.
- K. Emergency-Egress Release: Flush, wall-mounted handle mechanism, for accessibility-code-compliant egress feature, not dependent on electric power. The release allows an unlocked grille to partially open without affecting limit switches to permit passage, and it automatically resets motor drive upon return of handle to original position.

## 2.11 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM/NOMMA's "Metal Finishes Manual for Architectural and Metal Products (AMP 500-06)" for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## 2.12 ALUMINUM FINISHES

- A. Baked-Enamel or Powder-Coat Finish: AAMA 2603. Comply with coating manufacturer's written instructions for cleaning, conversion coating, application, and baking.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.
- B. Examine locations of electrical connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Install overhead coiling grilles and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports, according to manufacturer's written instructions and as specified.
- B. Install overhead coiling grilles, hoods, controls, and operators at the mounting locations indicated for each grille.
- C. Accessibility: Install overhead coiling grilles, switches, and controls along accessible routes in compliance with regulatory requirements for accessibility.
- D. Power-Operated Grilles: Install according to UL 325.

### 3.3 STARTUP SERVICE

- A. Perform installation and startup checks according to manufacturer's written instructions.
- B. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

3.4 ADJUSTING

- A. Adjust hardware and moving parts to function smoothly, so that grilles operate easily, free of warp, twist, or distortion.
- B. Lubricate bearings and sliding parts as recommended by manufacturer.

3.5 DEMONSTRATION

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

END OF SECTION 08 3326

## SECTION 08 3473 - SOUND-CONTROL DOOR ASSEMBLIES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes sound-control door assemblies consisting of swinging wood doors, steel frames, sound-control seals, and related accessories to achieve STC ratings indicated.
- B. Related Sections include the following:
  - 1. Section 08 1113 "Hollow Metal Doors and Frames" for non-sound-control, hollow-metal doors and frames.
  - 2. Section 08 1416 "Flush Wood Doors" for non-sound-control wood doors.
  - 3. Section 08 7100 "Door Hardware" for hardware to the extent not specified in this Section, including locksets and cylinders.

#### 1.2 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings.

#### 1.3 PERFORMANCE REQUIREMENTS

- A. Sound Rating: Provide sound-control door assemblies that have been fabricated and tested as sound-retardant units, are identical to assemblies tested according to ASTM E 90 by an independent testing agency, and have the following minimum certified STC rating according to ASTM E 413:
  - 1. STC Rating: 44.

#### 1.4 SUBMITTALS

- A. Product Data: Include sound ratings, construction and hardware preparation details, material and gasketing descriptions, core descriptions, label compliance, dimensions of individual components and profiles, and finishes for sound-control door assemblies.
- B. Shop Drawings: In addition to requirements below, provide a schedule of doors and frames using same reference numbers for details and openings as those on Drawings.
  - 1. Elevations of each door design.
  - 2. Details of sound-control seals, door bottoms, and thresholds.
  - 3. Details of doors including vertical and horizontal edge details.
  - 4. Frame details for each frame type including dimensioned profiles.
  - 5. Details and locations of reinforcement and preparations for hardware.

6. Details of each different wall opening condition.
  7. Details of anchorages, accessories, joints, and connections.
- C. Samples for Verification: For each type of exposed finish required, prepared on Samples of not less than 3 by 5 inches.
  - D. Product Certificates: For each type of sound-control door assembly, signed by product manufacturer.
  - E. Qualification Data: For Installer.
  - F. Field quality-control test reports.
  - G. Product Test Reports: Based on evaluation of comprehensive sound-rating tests performed by a qualified testing agency, for each type of sound-control door assembly.
  - H. Maintenance Data: For sound-control door assemblies to include in maintenance manuals.
  - I. Warranty: Special warranty specified in this Section.

#### 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Acoustical Testing Agency Qualifications: An independent agency accredited as an acoustical laboratory according to the National Voluntary Laboratory Accreditation Program of NIST.
- C. Source Limitations: Obtain sound-control door assemblies, including doors, frames, sound-control seals, hinges (when integral for sound control), thresholds, and other items essential for sound control, through one source from a single manufacturer.
- D. Preinstallation Conference: Conduct conference at Project site.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver doors and frames 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 wood doors.
- B. Deliver frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store doors and frames under cover at Project site. Place units in a vertical position with heads up, spaced by blocking, on minimum 4-inch- high, wood blocking. Avoid using nonvented plastic or canvas shelters that could create a humidity chamber.

1. If wrappers on doors become wet, remove cartons immediately. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

#### 1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install sound-control wood doors until spaces are enclosed and weatherproof, 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.

#### 1.8 COORDINATION

- A. Coordinate installation of anchorages for sound-control door assemblies. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

#### 1.9 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of sound-control door assemblies that fail in materials or workmanship within specified warranty period.
  1. Failures include, but are not limited to, the following:
    - a. Failure to meet sound rating requirements.
    - b. Faulty operation of sound seals.
    - c. Deterioration of metals, metal finishes, and other materials beyond normal use or weathering.
    - d. Wood doors that are warped (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section, or show telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.
  2. Warranty Period for Wood Doors: Two years from date of Substantial Completion.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. Sound-Control Door Assemblies with Wood Doors:
    - a. Ambico Limited.

- b. Krieger Steel Products Co.
- c. Overly Door Company.
- d. Security Acoustics; Div. of Security Metal Products Corp.

## 2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B, suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Supports and Anchors: After fabricating, galvanize units to be built into exterior walls according to ASTM A 153/A 153M, Class B.
- D. Inserts, Bolts, and Fasteners: Provide items to be built into exterior walls, hot-dip galvanized according to ASTM A 153/A 153M.
- E. Grout: Comply with ASTM C 476, with a slump of 4 inches for sound-control door frames built into concrete or masonry, as measured according to ASTM C 143/C 143M.
- F. Mineral Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool with 6 to 12 lb/cu. ft. density; with maximum flame-spread and smoke-developed indexes of 25 and 50 respectively; passing ASTM E 136 for combustion characteristics.

## 2.3 WOOD DOORS

- A. Provide flush-design wood doors, not less than 1-3/4 inches thick; with manufacturer's standard sound-retardant core as required to provide STC rating indicated. Fabricate wood doors with tolerances according to WDMA 1.S.1-A.
- B. Comply with Division 8 Section "Flush Wood Doors" for grade, faces, veneer matching, fabrication, finishing, and other requirements, unless otherwise indicated.
  - 1. Stiles: Same species as faces.

## 2.4 STEEL FRAMES

- A. General: Fabricate sound-control door frames of full-welded unit construction, with corners mitered, reinforced, and continuously welded full depth and width of frame. Knocked-down frames are not acceptable.
  - 1. Interior Frames: Formed from minimum 0.067-inch- thick, cold-rolled steel sheet, unless otherwise indicated.

- B. Hardware Reinforcement: Fabricate reinforcement plates from same material as door frame to comply with the following minimum sizes:
  - 1. Hinges: Minimum 0.167 inch thick by 1-1/2 inches wide by 6 inches longer than hinge, secured by not less than 6 spot welds.
  - 2. Strikes and Closers: Minimum 0.093 inch thick.
  - 3. Surface-Mounted Hardware: Minimum 0.093 inch thick.
- C. Head Reinforcement: Minimum 0.093-inch- thick, steel channel or angle stiffener.
- D. Jamb Anchors:
  - 1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, formed of same material as frame, not less than 0.053 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.156 inch wide.
  - 2. Stud Wall Type: Designed to engage metal stud, welded to back of frames; formed of same material as frame, not less than 0.042 inch thick.
  - 3. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch-diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall with throat reinforcement plate, welded to frame at each anchor location.
- E. Floor Anchors: Formed of same material as door frame, not less than 0.067 inch thick, and as follows:
  - 1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
- F. Ceiling Struts: Minimum 3/8-inch-thick by 2-inch- wide steel.
- G. Miscellaneous Components: Fabricated from hot- or cold-rolled steel sheet.

## 2.5 STOPS AND MOLDINGS

- A. Fixed Frame Moldings: Formed integral with sound-control frames, unless otherwise indicated.

## 2.6 DOOR HARDWARE

- A. General: Provide manufacturer's standard sound-control system, including head and jamb seals, door bottoms, cam-lift hinges, and thresholds, as required by testing to achieve STC rating indicated.
- B. Compression Seals: One-piece units; consisting of closed-cell sponge neoprene seal held in place by metal retainer; with retainer cover of same material as door frame; attached to door frame with concealed screws.

- C. Magnetic Seals: One-piece units; consisting of closed-cell sponge neoprene seal and resiliently mounted magnet held in place by metal retainer; with retainer cover of same material as door frame; attached to door frame with concealed screws.
- D. Automatic Door Bottoms: Neoprene or silicone gasket, held in place by metal housing, that automatically drops to form seal when door is closed; mounted to bottom edge of door with screws.
  - 1. Mounting: Mortised or semimortised into bottom of door or surface mounted on face of door as required by testing to achieve STC rating indicated.
- E. Door Bottoms: Neoprene or silicone gasket held in place by metal housing; mortised into bottom edge of door.
- F. Cam-Lift Hinges: Full-mortise template type that raises door 1/2 inch when door is fully open; with hardened pin; fabricated from stainless steel.
- G. Thresholds: Flat, smooth, unfluted type as recommended by manufacturer; fabricated from aluminum.
  - 1. Finish: Clear anodic finish.

## 2.7 FABRICATION

- A. General: Fabricate sound-control door assemblies to be rigid and free of defects, warp, or buckle. 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. Wood Doors: Factory fit doors to suit frame-opening sizes indicated, with uniform clearances and bevels according to referenced quality standard, unless otherwise indicated. Comply with final door hardware schedules and hardware templates.
  - 1. Comply with clearance requirements in NFPA 80 for fire-rated doors.
- C. Steel Frames: Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Weld exposed joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
  - 1. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners, unless otherwise indicated.
  - 2. Where installed in masonry, leave vertical mullions in frames open at top for grouting.
  - 3. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
  - 4. Jamb Anchors: Provide number and spacing of anchors as follows:
    - a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

- 1) Two anchors per jamb up to 60 inches in height.
  - 2) Three anchors per jamb from 60 up to 90 inches in height.
  - 3) Four anchors per jamb from 90 up to 96 inches in height.
  - 4) Four anchors per jamb plus one additional anchor per jamb for each 24 inches or fraction thereof more than 96 inches in height.
- b. Stud Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
- 1) Three anchors per jamb up to 60 inches in height.
  - 2) Four anchors per jamb from 60 up to 90 inches in height.
  - 3) Five anchors per jamb from 90 up to 96 inches in height.
  - 4) Five anchors per jamb plus one additional anchor per jamb for each 24 inches or fraction thereof more than 96 inches in height.
  - 5) Two anchors per head for frames more than 42 inches wide and mounted in metal stud partitions.
- c. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.
5. Head Reinforcement: For frames more than 48 inches wide, provide continuous head reinforcement for full width of opening, welded to back of frame at head.

D. Hardware Preparation:

1. Steel Frames: Factory prepare sound-control doors and frames to receive templated mortised hardware, including providing cutouts, reinforcement, mortising, drilling, and tapping, according to the Door Hardware Schedule and templates furnished as specified in Section 08 1700 Door Hardware."
  - a. Reinforce doors and frames to receive non-templated mortised and surface-mounted door hardware.
  - b. Comply with HMMA 830, "Hardware Preparation and Locations for Hollow Metal Doors and Frames."
2. Wood Doors: Locate door hardware as indicated, or if not indicated, according to DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
  - a. Coordinate measurements of hardware mortises in steel frames to verify dimensions and alignment before factory machining.

2.8 STEEL FINISHES

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
1. Finish sound-control steel door assemblies after assembly.

- B. Steel Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning"; remove dirt, oil, grease, or other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel; comply with SSPC-SP 3, "Power Tool Cleaning," or SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
- C. Factory Priming for Field-Painted Finish: Apply shop primer specified below immediately after surface preparation and pretreatment. Apply a smooth coat of even consistency to provide a uniform dry film thickness of not less than 0.7 mils.
  - 1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied finish paint system indicated; and providing a sound foundation for field-applied topcoats despite prolonged exposure.

## 2.9 WOOD FINISHES

- A. Finish sound-control wood doors after assembly.
- B. Factory finish sound-control wood doors to match doors specified in Section 08 1416 "Flush Wood Doors."

## 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 sound-control door assemblies.
  - 1. Examine roughing-in for embedded and built-in anchors to verify actual locations of sound-control door frame connections before frame installation.
  - 2. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
  - 3. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory.
- B. Prior to installation and with installation spreaders in place, adjust and securely brace sound-control door frames for squareness, alignment, twist, and plumb to the following tolerances:
  - 1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.

2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
  3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
  4. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.
- C. Drill and tap doors and frames to receive non-templated mortised and surface-mounted door hardware.

### 3.3 INSTALLATION

- A. General: Install sound-control door assemblies plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.
- B. Frames: Install sound-control door frames in sizes and profiles indicated.
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 due to shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, make splice smooth, flush, and invisible on exposed faces.
    - b. Install sound-control frames with removable glazing stops located on secure side of opening.
    - c. Remove temporary braces only after frames or bucks have been properly set and secured.
    - d. Check plumb, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
    - e. Apply bituminous coating to backs of frames that are filled with mortar, grout, and plaster containing antifreezing agents.
    - f. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor and secure with postinstalled expansion anchors.
      - 1) Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors, if so indicated and approved on Shop Drawings.
    - g. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
    - h. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar as specified in Division 4 Section "Unit Masonry Assemblies."
    - i. In-place Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.

2. Ceiling Struts: Extend struts vertically from top of frame at each jamb to supporting construction above, unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction above. Provide adjustable wedged or bolted anchorage to frame jamb members.
  3. Installation Tolerances: Adjust sound-control 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 on a perpendicular line from head to floor.
- C. Doors: Fit sound-control doors accurately in frames, within clearances indicated below. Shim as necessary.
1. Non-Fire-Rated Doors: Fit non-fire-rated doors accurately in frames with the following clearances:
    - a. Jambs: 1/8 inch.
    - b. Head with Butt Hinges: 1/8 inch.
    - c. Head with Cam-Lift Hinges: As required by manufacturer, but not more than 3/8 inch.
    - d. Sill: Manufacturer's standard.
    - e. Between Edges of Pairs of Doors: 1/8 inch.
- D. Sound-Control Seals: Where seals have been prefit and preinstalled in the factory and subsequently removed for shipping, reinstall seals and adjust according to manufacturer's written instructions.
- E. Cam-Lift Hinges: Install hinges according to manufacturer's written instructions.
- F. Thresholds: Set thresholds in full bed of sealant complying with requirements in Section 07 9200 "Joint Sealants."
- 3.4 FIELD QUALITY CONTROL
- A. Testing Agency: Engage a qualified independent acoustical testing and inspecting agency to perform field tests and inspections and prepare test reports.
  - B. Testing Services: Acoustical testing and inspecting agency shall select one sound-control door at random from sound-control door assemblies that are completely installed and perform testing for verification that assembly complies with STC rating requirements.

1. Field tests shall be conducted according to ASTM E 336, with results calculated according to ASTM E 413. Acceptable field STC values shall be within 5 dB of laboratory STC values.
  2. Inspection Report: Testing and inspecting agency shall submit report in writing to Architect and Contractor within 24 hours after testing.
- C. Remove and replace sound-control door assemblies where test results indicate that they do not comply with specified STC rating requirements.
- D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

### 3.5 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and adjust operating hardware items just before final inspection. Leave work in complete and proper operating condition.
- B. Remove and replace defective work, including defective or damaged sound seals and doors and frames that are warped, bowed, or otherwise unacceptable.
1. Adjust gaskets, gasket retainers, and retainer covers to provide contact required to achieve STC rating.
- C. Clean grout off sound-control door frames immediately after installation.
- D. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying primer.

END OF SECTION 08 3473

## SECTION 08 4113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Exterior and interior storefront framing.
2. Storefront framing for punched openings.
3. Storefront framing for ribbon walls.
4. Exterior and interior manual-swing entrance doors and door frame units.

#### 1.2 PREINSTALLATION MEETINGS

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

#### 1.3 ACTION SUBMITTALS

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

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

##### B. LEED Submittal:

1. Product Data for Credit EQ 4.1: For sealants used inside of the weatherproofing system, including printed statement of VOC content.

##### C. Shop Drawings: For aluminum-framed entrances and storefronts. Include plans, elevations, sections, full-size details, and attachments to other work.

1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
2. Include full-size isometric details of each vertical-to-horizontal intersection of aluminum-framed entrances and storefronts, showing the following:
  - a. Joinery, including concealed welds.
  - b. Anchorage.
  - c. Expansion provisions.
  - d. Glazing.
  - e. Flashing and drainage.
3. Show connection to and continuity with adjacent air barriers.

4. Include electronic copies of manufacturer's installation instructions of all systems to be used on the project.
- D. Samples for Initial Selection: For units with factory-applied color finishes.
- E. Fabrication Sample: Of each vertical-to-horizontal intersection of assemblies, made from 12-inch lengths of full-size components and showing details of the following:
  1. Joinery, including concealed welds.
  2. Anchorage.
  3. Expansion provisions.
  4. Glazing.
  5. Flashing and drainage.
- F. 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.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and field testing agency.
- B. Energy Performance Certificates: For aluminum-framed entrances and storefronts, accessories, and components, from manufacturer.
  1. Basis for Certification: NFRC-certified energy performance values for each aluminum-framed entrance and storefront.
- C. Product Test Reports: For aluminum-framed entrances and storefronts, for tests performed by a qualified testing agency as per performance requirement specified in article 2.1 below.
- D. Quality-Control Program: Developed specifically for Project, including fabrication and installation, according to recommendations in ASTM C 1401. Include periodic quality-control reports.
- E. Field quality-control reports.
- F. Maintenance data.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Warranties: Sample of special warranties.
- B. Record Drawings: Provide electronic shop drawings which fully depict the final installation of the aluminum framed entrances and storefront materials as actually installed. Within the drawings, define adjustments made relative to the framing, glazing and installation techniques used during installation.

- C. Maintenance Data for Structural Sealant: For structural-sealant-glazed storefront to include in maintenance manuals. Include ASTM C 1401 recommendations for post-installation-phase quality-control program.

#### 1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated and accredited by IAS or ILAC Mutual Recognition Arrangement as complying with ISO/IEC 17025.
- C. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.
  - 1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.
- D. Accessible Entrances: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.
- E. Structural-Sealant Glazing: Comply with ASTM C 1401, "Guide for Structural Sealant Glazing" for design and installation of structural-sealant-glazed systems.
- F. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
  - 1. Build mockup of typical wall area as shown on Drawings.
  - 2. Field testing shall be performed on mockups according to requirements in "Field Quality Control" Article.
  - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
  - 4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

#### 1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of aluminum-framed systems that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.
- B. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes do not comply with requirements or that fail in materials or workmanship within specified warranty period. Warranty does not include normal weathering.
  1. Warranty Period: 10 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 4000 "Quality Requirements," to design aluminum-framed entrances and storefronts.
- B. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
  1. Aluminum-framed entrances and storefronts shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
  2. Failure also includes the following:
    - a. Thermal stresses transferring to building structure.
    - b. Glass breakage.
    - c. Noise or vibration created by wind and thermal and structural movements.
    - d. Loosening or weakening of fasteners, attachments, and other components.
    - e. Failure of operating units.
- C. Structural Loads:
  1. Wind Loads: 90 mph.
  2. Building Category: C.
  3. Importance factor: 1.15
  4. Other Design Loads: As indicated on Drawings.
- D. Deflection of Framing Members:
  1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane shall not exceed  $L/175$  of the glass edge length for each individual glazing lite 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  $L/360$  of clear span or  $1/8$  inch, whichever is smaller.

- E. Structural: Test according to ASTM E 330 as follows:
1. When tested at positive and negative wind-load design pressures, assemblies 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: 10 seconds.
- F. Air Infiltration: Test according to ASTM E 283 for infiltration as follows:
1. Fixed Framing and Glass Area:
    - a. Maximum air leakage of 0.06 cfm/sq. ft. at a static-air-pressure differential of 6.24 lbf/sq. ft.
  2. Entrance Doors:
    - a. Pair of Doors: Maximum air leakage of 1.0 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft.
    - b. Single Doors: Maximum air leakage of 0.5 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft.
- G. Water Penetration under Static Pressure: Test according to ASTM E 331 as follows:
1. No evidence of water penetration through fixed glazing and framing areas when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 12 lbf/sq. ft.
- H. Water Penetration under Dynamic Pressure: Test according to AAMA 501.1 as follows:
1. No evidence of water penetration through fixed glazing and framing areas when tested at dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft..
  2. Maximum Water Leakage: According to AAMA 501.1. Water leakage does not include water controlled by flashing and gutters, or water that is drained to exterior.
- I. Seismic Performance: Aluminum-framed entrances and storefronts shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
1. Seismic Drift Causing Glass Fallout: Complying with criteria for passing based on building occupancy type when tested according to AAMA 501.6 at design displacement and 1.5 times the design displacement.
- J. Energy Performance: Certify and label energy performance according to NFRC as follows:
1. Thermal Transmittance (U-factor): Fixed glazing and framing areas shall have U-factor of not more than 0.45 Btu/sq. ft. x h x deg F as determined according to NFRC 100.

2. Solar Heat Gain Coefficient: Fixed glazing and framing areas shall have a solar heat gain coefficient of no greater than 0.40 as determined according to NFRC 200.
  3. Condensation Resistance: Fixed glazing and framing areas shall have an NFRC-certified condensation resistance rating of no less than 25 as determined according to NFRC 500.
- K. Windborne-Debris Impact Resistance: Pass missile-impact and cyclic-pressure tests when tested according to ASTM E 1886 and testing information in ASTM E 1996 for Wind Zone 1.
1. Large-Missile Test: For glazed openings located within 30 feet of grade.
- L. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes:
1. Temperature Change: 180 deg F, material surfaces.
  2. Thermal Cycling: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.
    - 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.
    - c. Interior Ambient-Air Temperature: 75 deg F.
- M. Structural-Sealant Joints:
1. Designed to carry gravity loads of glazing.
  2. Designed to produce tensile or shear stress of less than 20 psi.
- N. Structural Sealant: Capable of withstanding tensile and shear stresses imposed by structural-sealant-glazed storefront system without failing adhesively or cohesively. When tested for preconstruction adhesion and compatibility, cohesive failure of sealant shall occur before adhesive failure.
1. Adhesive failure occurs when sealant pulls away from substrate cleanly, leaving no sealant material behind.
  2. Cohesive failure occurs when sealant breaks or tears within itself but does not separate from each substrate because sealant-to-substrate bond strength exceeds sealant's internal strength.
- 2.2 MANUFACTURERS
- A. Basis-of-Design Product: Subject to compliance with requirements, provide **Trifab VG 451 SSG** or **Trifab VG 451 Weatherseal** as provided by Kawneer or comparable flushed glazed framing system by one of the following:
1. EFCO Corporation.
  2. United States Aluminum.
  3. Vistawall Architectural Products; The Vistawall Group; a Bluescope Steel company.

4. Manko Window Systems, Inc.

B. Source Limitations: Obtain all components of aluminum-framed entrance and storefront system, including framing and accessories, from single manufacturer.

## 2.3 FRAMING

A. Framing Members: Manufacturer's extruded- or formed-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 two sides and structural sealant on two sides.
3. Glazing Plane: Front.
4. Finish: High-performance organic finish.
5. Fabrication Method: Field-fabricated stick system.

B. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

C. Materials:

1. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
  - a. Sheet and Plate: ASTM B 209.
  - b. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
  - c. Extruded Structural Pipe and Tubes: ASTM B 429.
  - d. Structural Profiles: ASTM B 308/B 308M.
2. 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.
  - a. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
  - b. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
  - c. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

## 2.4 ENTRANCE DOOR SYSTEMS

A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.

1. Door Construction: 2-inch overall thickness, with minimum 0.188-inch- thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.

- a. Thermal Construction: High-performance plastic connectors separate aluminum members exposed to the exterior from members exposed to the interior.
2. Door Design: Medium stile; 3-1/2-inch 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: Beveled, snap-on, extruded-aluminum stops and preformed gaskets.
  - a. Provide nonremovable glazing stops on outside of door.

## 2.5 ENTRANCE DOOR HARDWARE

- A. Entrance Door Hardware: Hardware not specified in this Section is specified in Section 08 7100 "Door Hardware."

## 2.6 GLAZING SYSTEMS

- A. Glazing: As specified in Section 08 8000 "Glazing."
- B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.
- C. Glazing Sealants: As recommended by manufacturer.
- D. Sealants used inside the weatherproofing system shall have a VOC content of 250 g/L.
- E. Structural Glazing Sealants: ASTM C 1184, chemically curing silicone formulation that is compatible with system components with which it comes in contact, specifically formulated and tested for use as structural sealant and approved by structural-sealant manufacturer for use in storefront system indicated.
  1. Color: As selected by Architect from manufacturer's full range of colors.
- F. Weatherseal Sealants: ASTM C 920 for Type S; Grade NS; Class 25; Uses NT, G, A, and O; chemically curing silicone formulation that is compatible with structural sealant and other system components with which it comes in contact; recommended by structural-sealant, weatherseal-sealant, and structural-sealant-glazed storefront manufacturers for this use.
  1. Color: Match structural sealant.

## 2.7 ACCESSORIES

- A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
  2. Reinforce members as required to receive fastener threads.
  3. Do not use system that requires exposed fasteners.
- B. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.
1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123/A 123M or ASTM A 153/A 153M requirements.
- C. Concealed Flashing: Dead-soft, 0.018-inch-thick stainless steel, ASTM A 240/A 240M of type recommended by manufacturer.
- D. 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. Physical and thermal isolation of glazing from framing members.
  4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
  5. Provisions for field replacement of glazing from exterior.
  6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
- D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.
- E. Structural-Sealant-Glazed Framing Members: Include accommodations for using temporary support device to retain glazing in place while structural sealant cures.
- 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. High-Performance Organic Finish: 2-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat.

1. Color and Gloss: As selected by Architect from manufacturer's full range.

## 2.10 SOURCE QUALITY CONTROL

A. Structural Sealant: Perform quality-control procedures complying with ASTM C 1401 recommendations including, but not limited to, assembly material qualification procedures, sealant testing, and assembly fabrication reviews and checks.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas, 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. Prepare surfaces that are in contact with structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.

### 3.3 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 and to prevent impeding movement of moving joints.
6. Seal perimeter and other joints watertight unless otherwise indicated.

#### B. Metal Protection:

1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

#### C. Set continuous sill members and flashing in full sealant bed as specified in Section 07 9200 "Joint Sealants" to produce weathertight installation.

#### D. Install components plumb and true in alignment with established lines and grades.

#### E. Install operable units level and plumb, securely anchored, and without distortion. Adjust weather-stripping contact and hardware movement to produce proper operation.

#### F. Install glazing as specified in Section 08 8000 "Glazing."

#### G. Install weatherseal sealant according to Section 07 9200 "Joint Sealants" and according to sealant manufacturer's written instructions to produce weatherproof joints. Install joint filler behind sealant as recommended by sealant manufacturer.

#### H. 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.

### 3.4 ERECTION TOLERANCES

#### A. Erection Tolerances: Install aluminum-framed entrances and storefronts to comply with the following maximum tolerances:

1. Plumb: 1/8 inch in 10 feet; 1/4 inch in 40 feet.

2. Level: 1/8 inch in 20 feet; 1/4 inch in 40 feet.
3. Alignment:
  - a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch wide, limit offset from true alignment to 1/16 inch.
  - b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch wide, limit offset from true alignment to 1/8 inch.
  - c. Where surfaces are separated by reveal or protruding element of 1 inch wide or more, limit offset from true alignment to 1/4 inch.
4. Location: Limit variation from plane to 1/8 inch in 12 feet; 1/2 inch over total length.

### 3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Field Quality-Control Testing: Perform the following test on representative areas of aluminum-framed entrances and storefronts.
  1. Water-Spray Test: Before installation of interior finishes has begun, areas designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.
    - a. Perform a minimum of three tests in areas as directed by Architect.
    - b. Perform tests in each test area as directed by Architect. Perform at least three tests, prior to 10, 35, and 70 percent completion.
- C. Structural-Sealant Adhesion: Test structural sealant according to recommendations in ASTM C 1401, Destructive Test Method A, "Hand Pull Tab (Destructive)," Appendix X2.
  1. Test a minimum of four areas on each building facade.
  2. Repair installation areas damaged by testing.
- D. Aluminum-framed entrances and storefronts will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports.

### 3.6 MAINTENANCE SERVICE

- A. Entrance Door Hardware:
  1. 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 entrance door hardware.

- B. Initial Maintenance Service: Beginning at Substantial Completion, provide 12 months' full maintenance by skilled employees of entrance door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper entrance door hardware operation at rated speed and capacity. Use parts and supplies that are the same as those used in the manufacture and installation of original equipment.

END OF SECTION 08 4113

## SECTION 08 4426 - STRUCTURAL-SEALANT-GLAZED CURTAIN WALLS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes the following types of structural-sealant-glazed curtain walls with aluminum framing systems:
  - 1. Field-glazed two-sided systems.
- B. Related Sections include the following:
  - 1. Section 07 9200 "Joint Sealants" for installation of joint sealants installed with structural-sealant-glazed curtain-wall systems and for sealants to the extent not specified in this Section.
  - 2. Section 08 4113 "Aluminum Entrances and Storefronts" for entrance and storefront systems installed with structural-sealant-glazed curtain-wall systems.
  - 3. Section 08 8000 "Glazing" for insulating-glass requirements.

#### 1.2 PREINSTALLATION MEETINGS

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

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. LEED Submittal:
  - 1. Product Data for Credit EQ 4.1: For glazing sealants used inside of the weatherproofing system, including printed statement of VOC content.
- C. Shop Drawings: For aluminum-framed entrances and storefronts. Include plans, elevations, sections, full-size details, and attachments to other work.
  - 1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
  - 2. Include full-size isometric details of each vertical-to-horizontal intersection of aluminum-framed entrances and storefronts, showing the following:
    - a. Joinery, including concealed welds.

- b. Anchorage.
    - c. Expansion provisions.
    - d. Glazing.
    - e. Flashing and drainage.
  3. Show connection to and continuity with adjacent air barriers.
  4. Include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
  5. Provide an electronic copy of manufacturer's standard installation instructions for all systems to be installed on the project.
- D. Samples for Initial Selection: For units with factory-applied color finishes.
- E. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.
- F. Fabrication Sample: Of each vertical-to-horizontal intersection of systems, made from 12-inch lengths of full-size components and showing details of the following:
  1. Joinery.
  2. Anchorage.
  3. Expansion provisions.
  4. Glazing.
  5. Flashing and drainage.
- G. Delegated-Design Submittal: For curtainwall 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.

#### 1.4 INFORMATION SUBMITTALS

- A. Qualification Data: For Installer and testing agency.
- B. Energy Performance Certificates: For glazed aluminum curtain walls, accessories, and components, from manufacturer.
  1. Basis for Certification: NFRC-certified energy performance values for each glazed aluminum curtain wall.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for structural-sealant-glazed curtain-wall systems.
- D. Quality-Control Program: Developed specifically for Project, including fabrication and installation, according to recommendations in ASTM C 1401. Include periodic quality-control reports.
- E. Maintenance data.

1.5 CLOSEOUT SUBMITTALS

- A. Warranties: Special warranties specified in this Section.
- B. Record Drawings: Provide electronic shop drawings which fully depict the final installation of the aluminum framed entrances and storefront materials as actually installed. Within the drawings, define adjustments made relative to the framing, glazing and installation techniques used during installation.
- C. Maintenance Data for Structural Sealant: For structural-sealant-glazed storefront to include in maintenance manuals. Include ASTM C 1401 recommendations for post-installation-phase quality-control program.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Testing Agency Qualifications: An independent agency qualified according to ASTM E 699 for testing indicated.
- C. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.
  - 1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.
- D. Welding: Qualify procedures and personnel according to AWS D1.2, "Structural Welding Code--Aluminum."
- E. Structural-Sealant Glazing: Comply with recommendations in ASTM C 1401, "Guide for Structural Sealant Glazing."
- F. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
  - 1. Build mockup of typical wall area as shown on Drawings.
  - 2. Field testing shall be performed on mockups according to requirements in "Field Quality Control" Article.
  - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
  - 4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

## 1.7 WARRANTY

- A. Special Assembly Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of structural-sealant-glazed curtain-wall systems that do not comply with requirements or that deteriorate as defined in this Section within specified warranty period.
1. Failures include, but are not limited to, the following:
    - a. Structural failures including, but not limited to, excessive deflection.
    - b. Noise or vibration caused by thermal movements.
    - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
    - d. Adhesive or cohesive sealant failures.
    - e. Water leakage.
    - f. Failure of operating components to function normally.
  2. Warranty Period: Five years from date of Substantial Completion.
- B. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes fail 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 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 4000 "Quality Requirements," to design aluminum-framed entrances and storefronts.
- B. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
1. Structural-sealant-glazed curtainwalls shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
  2. Failure also includes the following:
    - a. Thermal stresses transferring to building structure.
    - b. Glass breakage.
    - c. Noise or vibration created by wind and thermal and structural movements.
    - d. Loosening or weakening of fasteners, attachments, and other components.
    - e. Failure of operating units.

- C. Structural-Sealant Joints: Designed to produce tensile or shear stress in structural-sealant joints of less than 20 psi.
- D. Structural Loads:
  - 1. Wind Loads: 90 mph.
  - 2. Building Category: C.
  - 3. Importance factor: 1.15
  - 4. Other Design Loads: As indicated on Drawings.
  - 5. Seismic Loads: As indicated on Drawings.
- E. 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  $1/360$  of clear span or  $1/8$  inch, whichever is smaller.
- F. Structural: Test according to ASTM E 330 as follows:
  - 1. When tested at positive and negative wind-load design pressures, assemblies 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 Duration: As required by design wind velocity but not less than 10 seconds.
- G. Air Infiltration: Test according to ASTM E 283 for infiltration as follows:
  - 1. Fixed Framing and Glass Area:
    - a. Maximum air leakage of 0.06 cfm/sq. ft. at a static-air-pressure differential of 6.24 lbf/sq. ft.
- H. Water Penetration Under Static Pressure: Provide structural-sealant-glazed curtain-wall systems that do not evidence water penetration when tested according to ASTM E 331 at a minimum differential static pressure of 20 percent of positive design wind load, but not less than 12 lbf/sq. ft.
- I. Water Penetration Under Dynamic Pressure: Provide structural-sealant-glazed curtain-wall systems that do not evidence water leakage when tested according to AAMA 501.1 under dynamic pressure equal to 20 percent of positive design wind load, but not less than 10 lbf/sq. ft.
  - 1. Maximum Water Leakage: According to AAMA 501.1. Water controlled by flashing and gutters that is drained to exterior and cannot damage adjacent materials or finishes is not considered water leakage.

- J. Seismic Performance: Aluminum-framed entrances and storefronts shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
1. Seismic Drift Causing Glass Fallout: Complying with criteria for passing based on building occupancy type when tested according to AAMA 501.6 at design displacement and 1.5 times the design displacement.
- K. Energy Performance: Certify and label energy performance according to NFRC as follows:
1. Thermal Transmittance (U-factor): Fixed glazing and framing areas shall have U-factor of not more than 0.45 Btu/sq. ft. x h x deg F as determined according to NFRC 100.
  2. Solar Heat Gain Coefficient: Fixed glazing and framing areas shall have a solar heat gain coefficient of no greater than 0.40 as determined according to NFRC 200.
  3. Condensation Resistance: Fixed glazing and framing areas shall have an NFRC-certified condensation resistance rating of no less than 25 as determined according to NFRC 500.
- L. Windborne-Debris Impact Resistance: Pass missile-impact and cyclic-pressure tests when tested according to ASTM E 1886 and testing information in ASTM E 1996 for Wind Zone 1.
1. Large-Missile Test: For glazed openings located within 30 feet of grade.
- M. Thermal Movements: Provide structural-sealant-glazed curtain-wall 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): 180 deg F, material surfaces.
  2. Test Performance: No buckling, stress on glass, glazing edge-seal failure, sealant failure, excess stress on curtain-wall framing, anchors and fasteners, or reduction of performance when tested according to AAMA 501.5.
    - a. Test High Exterior Ambient Air Temperature: That which produces an exterior metal surface temperature of 180 deg F (82 deg C).
    - b. Test Low Exterior Ambient Air Temperature: 0 deg F (minus 18 deg C).
    - c. Test Interior Ambient Air Temperature: 75 deg F (24 deg C).
- N. Structural-Sealant Joints:
1. Designed to carry gravity loads of glazing.
  2. Designed to produce tensile or shear stress of less than 20 psi.
- O. Structural Sealant: Capable of withstanding tensile and shear stresses imposed by curtain-wall systems without failing adhesively or cohesively. Provide sealant that fails cohesively before sealant releases from substrate when tested for adhesive compatibility with each substrate and joint condition required.
1. Adhesive failure occurs when sealant pulls away from substrate cleanly, leaving no sealant material behind.

2. Cohesive failure occurs when sealant breaks or tears within itself but does not separate from each substrate because sealant-to-substrate bond strength exceeds sealant's internal strength.

## 2.2 MANUFACTURERS

- A. Basis-of-Design Product: The design for structural-sealant-glazed curtain-wall systems is based on **1600 by Kawneer**. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
  1. EFCO Corporation.
  2. United States Aluminum.
  3. Manko Window Systems, Inc.
  4. Vistawall Architectural Products.
- B. Source Limitations: Obtain all components of aluminum-framed entrance and storefront system, including framing and accessories, from single manufacturer.

## 2.3 FRAMING

- A. Framing Members: Manufacturer's extruded- or formed-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 two sides and structural sealant on two sides.
  3. Glazing Plane: Front.
  4. Finish: High-performance organic finish.
- B. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.
- C. Materials:
  1. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
    - a. Sheet and Plate: ASTM B 209.
    - b. Extruded Bars, Rods, Shapes, and Tubes: ASTM B 221.
    - c. Extruded Structural Pipe and Tubes: ASTM B 429.
    - d. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.
  2. Steel Reinforcement: With manufacturer's standard 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.

- a. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
- b. Cold-Rolled Sheet and Strip: ASTM A 611.
- c. Hot-Rolled Sheet and Strip: ASTM A 570/A 570M.

## 2.4 GLAZING SYSTEMS

- A. Glazing: As specified in Section 08 8000 "Glazing."
- B. Spacers, Setting Blocks, Gaskets, and Bond Breakers: Manufacturer's standard permanent, nonmigrating types compatible with sealants and suitable for joint movement and system performance requirements.
- C. Glazing Sealants: As recommended by manufacturer for joint type and as follows:
  1. Structural Sealant: ASTM C 1184, neutral-curing silicone formulation compatible with system components with which it comes in contact, specifically formulated and tested for use as structural sealant, and approved by structural-sealant manufacturer for use in curtain-wall systems indicated.
    - a. Color: As selected by Architect from manufacturer's full range of colors.
    - b. Type: Single component.
    - c. Minimum Tensile Strength: 100 psi.
    - d. Modulus of Elasticity: As required by structural-sealant-glazed curtain-wall system design to meet performance requirements.
  2. Weatherseal Sealant: ASTM C 920 for Type S, Grade NS, Class 25, Uses NT, G, A, and O; neutral-curing silicone formulation compatible with structural sealant and other system components with which it comes in contact; and recommended by structural- and weatherseal-sealant and curtain-wall manufacturers for this use.
    - a. Joint Movement Capability: Accommodates a 50 percent increase or decrease in joint width at time of application when measured according to ASTM C 719.
    - b. Color: Matching structural sealant.

## 2.5 ACCESSORIES

- A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
  1. Where fasteners are subject to loosening or turn out from thermal and structural movements, wind loads, or vibration, use self-locking devices.
  2. Reinforce members as required to receive fastener threads.
  3. Do not use system that requires exposed fasteners.
  4. Finish exposed portions to match framing system.
  5. At movement joints, use slip-joint linings, spacers, and sleeves of material and type recommended by manufacturer.

- B. Anchors: Three-way adjustable anchors that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.
  - 1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123/A 123M or ASTM A 153/A 153M requirements.
- C. Concealed Flashing: Dead-soft, 0.018-inch- thick stainless steel, ASTM A 240/A 240M of type recommended by manufacturer.
- D. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil thickness per coat.

## 2.6 FABRICATION

- A. Form aluminum shapes before finishing.
- B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- C. Fabricate components that, when assembled, have the following characteristics:
  - 1. Sharp profiles, straight and free of defects or deformations.
  - 2. Accurately fitted joints with ends coped or mitered.
  - 3. Internal guttering systems or other means to drain water passing joints, condensation occurring 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 prevent glazing-to-glazing contact and to maintain required glazing edge clearances.
  - 6. Structural-sealant joints that do not carry gravity loads of glazing.
  - 7. Provisions for field replacement of glazing from exterior. Include accommodations for using temporary support device (dutchman) to retain glazing in place while sealant cures.
- D. Structural-Sealant-Glazed Framing Members: Include accommodations for using temporary support device to retain glazing in place while structural sealant cures.
- E. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

## 2.7 ALUMINUM FINISHES

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

- C. 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 2605 and with coating and resin manufacturers' written instructions.

1. Color and Gloss: As selected by Architect from manufacturer's full range.

## 2.8 SOURCE QUALITY CONTROL

- A. Structural Sealant: Perform quality-control procedures complying with ASTM C 1401 recommendations including, but not limited to, assembly material qualification procedures, sealant testing, and assembly fabrication reviews and checks.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
1. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Prepare surfaces that are in contact with structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.

### 3.3 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 and to prevent impeding movement of moving joints.
  6. Weld components in concealed locations to minimize distortion or discoloration of finish. Protect glazing surfaces from welding.
  7. 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 by applying sealant or tape or 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. Install components plumb and true in alignment with established lines and grades.
- E. Install glazing as specified Section 08 8000 "Glazing." Prepare surfaces that will contact structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.
- F. Install weatherseal sealant according to Section 07 9200 "Joint Sealants" and according to sealant manufacturer's written instructions to produce weatherproof joints. Install joint filler behind sealant as recommended by sealant manufacturer.
- G. Install insulation materials as specified in Section 07 2100 "Building Insulation."
- H. Erection Tolerances: Install structural-sealant-glazed curtain-wall systems to comply with the following maximum tolerances:
1. Plumb: 1/8 inch in 10 feet; 1/4 inch in 40 feet.
  2. Level: 1/8 inch in 20 feet; 1/4 inch in 40 feet.
  3. Alignment:
    - a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch wide, limit offset from true alignment to 1/16 inch.
    - b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch wide, limit offset from true alignment to 1/8 inch.
    - c. Where surfaces are separated by reveal or protruding element of 1 inch wide or greater, limit offset from true alignment to 1/4 inch.
  4. Location: Limit variation from plane to 1/8 inch in 12 feet; 1/2 inch over total length.

END OF SECTION 08 4426

## SECTION 08 4523 - FIBERGLASS-SANDWICH-PANEL ASSEMBLIES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes assemblies incorporating fiberglass sandwich panels and aluminum frame systems as follows:
  - 1. Skylight assemblies.
- B. Related Sections include the following:
  - 1. Section 05 1200 "Structural Steel Framing" for steel framing that supports skin-system assemblies.
  - 2. Section 07 6200 "Sheet Metal Flashing and Trim" for metal flashings installed at perimeters of assemblies.
  - 3. Section 07 9200 "Joint Sealants" for sealants installed at perimeters of assemblies.

#### 1.2 PREINSTALLATION MEETINGS

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

#### 1.3 PERFORMANCE TESTING

- A. Provide assemblies that comply with test-performance requirements indicated, as evidenced by reports of tests performed on manufacturer's standard assemblies by a qualified independent testing agency.
  - 1. Engage a testing agency to perform preconstruction tests on laboratory mockups of assemblies.
  - 2. Build laboratory mockups at testing agency facility using personnel, materials, and methods of construction that will be used at Project site.
  - 3. Notify Architect seven days in advance of the dates and times when laboratory mockups will be constructed.
  - 4. Preconstruction Testing Sequence: Perform specified tests on laboratory mockups in the following order:
    - a. Structural-performance preloading (ASTM E 330).
    - b. Air infiltration (ASTM E 283).
    - c. Water penetration under static pressure (ASTM E 331).
    - d. Water penetration under dynamic pressure (AAMA 501.1).
    - e. Water penetration, wind-driven rain (ICBO ES AC07).
    - f. Structural performance at design load (ASTM E 330).

- g. Repeat air filtration (ASTM E 283).
- h. Repeat water penetration under static pressure (ASTM E 331).
- i. Structural performance at specified maximum test load (ASTM E 330).

B. Structural-Performance Test: ASTM E 330.

1. Performance at Design Load: When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
2. Performance at Maximum Test Load: When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main supporting members exceeding 0.2 percent of span.
3. Test Durations: As required by design wind velocity but not less than 10 seconds.

C. Air-Infiltration Test: ASTM E 283.

1. Minimum Static-Air-Pressure Difference: 6.24 lbf/sq. ft.
2. Maximum Air Leakage: 0.06 cfm/sq. ft.

D. Test for Water Penetration under Static Pressure: ASTM E 331.

1. Minimum Static-Air-Pressure Difference: 20 percent of positive wind-load design pressure, but not less than 10 lbf/sq. ft.
2. Water Leakage: None.

E. Test for Water Penetration under Dynamic Pressure: AAMA 501.1.

1. Dynamic Pressure: 20 percent of positive wind-load design pressure, but not less than 15 lbf/sq. ft.
2. Water Leakage: No uncontrolled water penetrating systems or appearing on systems' normally exposed interior surfaces from sources other than condensation. Water controlled by flashing and gutters that is drained to exterior and cannot damage adjacent materials or finishes is not considered water leakage.

F. Water-Penetration, Wind-Driven-Rain Test: Wind-driven-rain test in ICBO ES AC07, "Special Roofing Systems."

1. Water Leakage: None.

1.4 ACTION SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for assemblies.

B. LEED Submittal:

1. Product Data for Credit EQ 4.1: For sealants used inside of the weatherproofing system, documentation including printed statement of VOC content.

- C. Shop Drawings: For assemblies. Include plans, elevations, sections, details, and attachments to other work.
  - 1. Include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- D. Samples for Initial Selection: For units with factory-applied color finishes.
- E. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.
- F. Fabrication Sample: Of each frame system intersection of assemblies, made from 12-inch lengths of full-size components and showing details of the following:
  - 1. Joinery.
  - 2. Anchorage.
  - 3. Expansion provisions.
  - 4. Fiberglass sandwich panels.
  - 5. Flashing and drainage.

#### 1.5 INFORMATION SUBMITTALS

- A. Field quality-control test reports.
- B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for assemblies.
- C. Evaluation Reports: For Fiberglass Sandwich Panels, from ICC-ES. For Panel and System showing exterior and interior face sheets proposed for this project.
- D. Preconstruction Testing Program: For assemblies, developed specifically for Project. Include plans, elevations, sections, and details of laboratory mockup.
- E. Preconstruction Test Reports: For assemblies.
- F. Maintenance Data: For assemblies to include in maintenance manuals.

#### 1.6 CLOSEOUT SUBMITTALS

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

#### 1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Entity capable of assuming engineering responsibility, including preparation of Shop Drawings, and performing work of this Section and who is acceptable to manufacturer.

- B. **Manufacturer Qualifications:** For fiberglass sandwich panels, a qualified manufacturer whose facilities, processes, and products are monitored by an independent, accredited quality-control agency for compliance with applicable requirements in ICBO ES AC04, "Sandwich Panels."
- C. **Testing Agency Qualifications:** An independent agency qualified according to ASTM E 699 for testing indicated.
- D. **Product Options:** Information on Drawings and in Specifications establishes requirements for assemblies' 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 testing conducted by an independent testing agency and in-service performance.
  - 1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.
- E. **Fire-Test-Response Characteristics:** Where fire-test-response characteristics are indicated for assemblies and components, provide products identical to those tested per test method indicated by an independent testing and inspecting agency acceptable to authorities having jurisdiction.
- F. **Welding:** Qualify procedures and personnel according to AWS D1.2, "Structural Welding Code - Aluminum."
- G. **NFRC Certification:** Provide fiberglass sandwich panels that are certified for U-factors indicated according to NFRC 100 and listed in its "National Fenestration Council Incorporated - Certified Products Directory."
  - 1. **NFRC Compliance Labeling:** Label skylights with manufacturer's certification label or label from another third-party certification agency acceptable to authorities having jurisdiction, certifying that skylight complies with requirements of NFRC. Label shall indicate manufacturer's name, type of product, U-factor, solar heat gain coefficient (SHGC), and Visible Transmittance of whole skylight.
- H. **Mockups:** Build mockups to demonstrate aesthetic effects and set quality standards for fabrication and installation.
  - 1. Build mockup of typical assembly area as shown on Drawings.
  - 2. Field testing shall be performed on mockups according to requirements in Part 3 "Field Quality Control" Article.
  - 3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

## 1.8 PROJECT CONDITIONS

- A. **Field Measurements:** Indicate measurements on Shop Drawings.

## 1.9 WARRANTY

- A. Special Assembly Warranty: Manufacturer's standard form in which manufacturer and Installer agree to repair or replace components of assemblies 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. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
    - c. Water leakage.
  2. Warranty Period: Five years from date of Substantial Completion.
- B. Special Fiberglass-Sandwich-Panel Warranty: Manufacturer's standard form in which manufacturer agrees to replace panels that exhibit defects in materials or workmanship.
1. Defects include, but are not limited to, the following:
    - a. Fiberbloom.
    - b. Delamination of coating, if any, from exterior face sheet.
    - c. Discoloration of exterior face sheet of more than 8.0 units Delta E when measured according ASTM D 2244.
    - d. Delamination of panel face sheets from panel cores.
  2. Warranty Period: 10 years from date of Substantial Completion.
- C. Special Aluminum-Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes fail within specified warranty period. Warranty does not include normal weathering.
1. Failures include, but are not limited to, checking, crazing, peeling, chalking, and fading of finishes.
  2. Warranty Period: Five years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Provide assemblies, including anchorage, capable of withstanding, without failure, the effects of the following:
1. Structural loads.
  2. Thermal movements.
  3. Movements of supporting structure.
  4. Dimensional tolerances of building frame and other adjacent construction.

B. Failure includes the following:

1. Deflection exceeding specified limits.
2. Water leakage.
3. Thermal stresses transferred to building structure.
4. Noise or vibration created by wind and thermal and structural movements.
5. Loosening or weakening of fasteners, attachments, and other components.
6. Delamination of fiberglass-sandwich-panel faces from panel cores.

C. Structural Loads:

1. Wind Loads: 90 mph.
2. Building Category: C.
3. Importance factor: 1.15
4. Other Design Loads: As indicated on Drawings.
5. Concentrated Live Loads on Overhead Assemblies: 300 lbf applied to assemblies at locations that will produce greatest stress or deflection.
6. Seismic Loads: As indicated by earthquake design data on Drawings.
7. Load Combinations: Calculate according to requirements of applicable code indicated on Drawings.

D. Deflection of Assemblies:

1. Overhead Assemblies: Limited to 1/180 of clear span for each assembly component.

E. Roof Assemblies: Class A per ASTM E 108 or UL 790.

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

G. NFRC Compliance:

1. Determine U-factor and SHGC for each skylight in accordance with National Fenestration Rating Council (NFRC) 100-97 (procedure for determining fenestration product U-factors) and NFRC 200-95 (procedure for product solar heat gain coefficients at normal incidence).
  - a. Provide system with maximum U-Factor of 0.6 and minimum SHGC of 0.4 as required for Climate Zone 5 on Table 502.3 of IECC 2009.
2. Use CMA method (Component Modeling Approach) to generate a "Bid Report" for site-built products.
3. After installation and prior to final inspection, retain an ACE (Approved Calculation Entity) to generate the NFRC label certificate for project based on actual products installed.

## 2.2 MANUFACTURERS

- A. Basis-of-Design Product: The design for assemblies is based on skylight system provided by **Kalwall Corporation**. Subject to compliance with requirements provide the specified assembly system or a comparable product by one of the following:
  - 1. Major Industries, Inc.
- B. Provide fiberglass-sandwich-panel assembly skylights with the following heat transference characteristics:
  - 1. Maximum U-Factor: 0.23.
  - 2. Maximum SHGC: 0.28.

## 2.3 ALUMINUM FRAME SYSTEMS

- A. Aluminum: Alloy and temper recommended in writing 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.
- B. Components: Manufacturer's standard extruded-aluminum members of thickness required and reinforced as required to support imposed loads.
- C. Exposed Flashing and Closures: Manufacturer's standard aluminum components not less than 0.060 inch thick.
- D. Frame-System Gaskets: Manufacturer's standard.
- E. Frame-System Sealants: As recommended in writing by manufacturer.
- F. Anchors, Fasteners, and Accessories: Manufacturer's standard, corrosion-resistant, nonstaining, and nonbleeding; compatible with adjacent materials.
  - 1. At closures, retaining caps, or battens, use ASTM A 193/A 193M, 300 series stainless-steel screws.
  - 2. Where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration, use self-locking devices.
  - 3. At movement joints, use slip-joint linings, spacers, and sleeves of material and type recommended in writing by manufacturer.
- G. Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123/A 123M or ASTM A 153/A 153M requirements.
- H. Anchor Bolts: ASTM A 307, Grade A, hot-dip zinc coating, ASTM A 153/A 153M, Class C.

I. Frame System Fabrication:

1. Fabricate components before finishing.
2. Fabricate components that, when assembled, have the following characteristics:
  - a. Profiles that are sharp, straight, and free of defects or deformations.
  - b. Accurately fitted joints with ends coped or mitered.
  - c. Internal guttering systems or other means to drain water passing joints, condensation occurring within components, and moisture migrating within the assembly to exterior.
3. Fabricate sill closures with weep holes and for installation as continuous component.
4. Reinforce components as required to receive fastener threads.
5. Weld components 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.

2.4 FIBERGLASS SANDWICH PANELS

- A. Panel Construction: Assembly of uniformly colored, translucent, thermoset, fiberglass-reinforced-polymer face sheets bonded to both sides of a grid core and complying with requirements applicable to panel materials in ICBO ES AC04, "Sandwich Panels."
1. For the interior face sheets of the skylights:
    - a. Face-Sheet, Self-Ignition Temperature: 650 deg F or more per ASTM D 1929.
    - b. Face-Sheet Burning Extent: 1 inch or less per ASTM D 635.
    - c. Roof-Covering Class: Class A per ASTM E 108 or UL 790.
    - d. Flamespread of Interior face sheets of skylight: Underwriters Laboratories (UL) listed, which requires periodic unannounced retesting, with Flamespread no greater than 50 and smoke developed no greater than 250 when tested in accordance with UL 723/ASTM E 84.
  - B. Panel Thickness: 4 inches, unless indicated otherwise.
  - C. Panel U-Factor: Not more than 0.23 thermally broken measured in Btu/sq. ft. x h x deg F according to NFRC 100 or ASTM C 1363 using procedures described in ASTM C 1199 and ASTM E 1423.
  - D. Panel Strength Characteristics:
    1. Maximum Panel Deflection: 3-1/2 inches when a 4-by-12-foot panel is tested according to ASTM E 72 at 34 lbf/ sq. ft., with a maximum 0.090-inch set deflection after 5 minutes.
    2. Panel Support Strength: Capable of supporting, without failure, a 300-lbf concentrated load when applied to a 3-inch- diameter disk according to ASTM E 661.
  - E. Panel Light Transmittance: 35 percent minimum.

F. Exterior Face Sheets:

1. Thickness: 0.070 inches.
2. Color: Crystal (by Kalwall) for top, or approved equivalent color by another manufacturer.
3. Color Stability: Not more than 3.0 units Delta E when measured according to ASTM D 2244 after outdoor weathering in southern Florida according to procedures in ASTM D 1435 with panels mounted facing south and as follows:
  - a. Panel Mounting Angle: Not more than 45 degrees from horizontal.
  - b. Exposure Period: 60 months.
4. Erosion Protection: Permanent glass erosion barrier embedded beneath surface to provide long-term resistance to reinforcing fiber exposure. Exterior face surface loss shall not exceed 0.7 mils and 40 mgs when tested in accordance with ASTM-D4060 employing CS17 abrasive wheels at a head load of 500 grams for 1000 cycles. Sacrificial surface films or coatings are not acceptable erosion barriers.

G. Interior Face Sheet:

1. Thickness: 0.045 inch.
2. Color: White (by Kalwall) or approved equivalent color by another manufacturer.

H. Fiberglass-Sandwich-Panel Adhesive: ASTM D 2559.

1. Compatible with facing and core materials.
2. Tensile and shear bond strength of aged adhesive ensures permanent adhesion of facings to cores, as evidenced by testing according to ASTM C 297 and ASTM D 1002 after accelerated aging procedures that comply with aging requirements for adhesives with high resistance to moisture in ICBO ES AC05, "Sandwich Panel Adhesives."

I. Panel Fabrication: Factory assemble and seal panels.

1. Laminate face sheets to grid core under a controlled process using heat and pressure to produce straight adhesive bonding lines that cover width of core members and that have sharp edges.
  - a. White spots indicating lack of bond at intersections of grid-core members are limited in number to 4 for every 40 sq. ft. of panel and limited in diameter to 3/64 inch.
2. Fabricate with grid pattern that is symmetrical about centerlines of each panel.
3. Fabricate panel to allow condensation within panel to escape.
4. Reinforce panel corners.

## 2.5 ACCESSORY MATERIALS

- A. Insulating Materials: Specified in Section 07 2100 "Thermal Insulation."

- 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.

## 2.6 ALUMINUM FINISHES

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- C. 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 2605 and with coating and resin manufacturers' written instructions.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
  - 1. 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 between aluminum components 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 and to prevent impeding movement of moving joints.
  - 6. Weld aluminum components in concealed locations to minimize distortion or discoloration of finish. Protect glazing surfaces from welding.
  - 7. Seal joints watertight, unless otherwise indicated.

- B. Metal Protection: Where aluminum components will contact dissimilar materials, protect against galvanic action by painting contact surfaces with bituminous paint or by installing nonconductive spacers as recommended in writing by manufacturer for this purpose.
- C. Install continuous aluminum sill closure with weatherproof expansion joints and locked and sealed or welded corners. Locate weep holes at rafters.
- D. Install components to drain water passing joints, condensation occurring within aluminum members and panels, and moisture migrating within assembly to exterior.
- E. Install components plumb and true in alignment with established lines and elevations.
- F. Install insulation materials as specified in Section 07 2100 "Thermal Insulation."
- G. Erection Tolerances: Install assemblies to comply with the following maximum tolerances:
  - 1. Alignment: Limit offset from true alignment to 1/32 inch where surfaces abut in line, edge to edge, at corners, or where a reveal or protruding element separates aligned surfaces by less than 3 inches; otherwise, limit offset to 1/8 inch.
  - 2. Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 feet; 1/2 inch over total length.

### 3.3 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Testing Services: Testing and inspecting of representative areas to determine compliance of installed assemblies with specified requirements shall take place as follows and in successive stages as indicated on Drawings. Do not proceed with installation of the next area until test results for previously completed areas show compliance with requirements.
  - 1. Water Penetration under Static Pressure: Before installation of interior finishes has begun, areas shall be tested according to ASTM E 1105.
    - a. Test Procedures: Test under uniform and cyclic static air pressure.
    - b. Water Penetration: None.
  - 2. Water-Spray Test: Before installation of interior finishes has begun, assemblies shall be tested according to AAMA 501.2 and shall not evidence water penetration.
- C. Repair or remove work where test results and inspections indicate that it does not comply with specified requirements.
- D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

Utah State Hospital Consolidation  
Department of Human Services  
1300 East Center Street  
Provo, Utah

Bid Documents

END OF SECTION 08 4523

## SECTION 08 5113 - ALUMINUM WINDOWS

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section includes the following:

1. Heavy commercial performance grade psychiatric aluminum windows for exterior locations.
2. Interior horizontal-sliding sliding windows.

B. Related Requirements:

1. Division 08 Section "Aluminum-Framed Entrances and Storefronts" for coordinating finish among aluminum fenestration units.

#### 1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review and discuss the finishing of aluminum windows that is required to be coordinated with the finishing of other aluminum work for color and finish matching.
3. Review, discuss, and coordinate the interrelationship of aluminum windows with other exterior wall components. Include provisions for anchorage, flashing, sealing perimeters, and protecting finishes.
4. Review and discuss the sequence of work required to construct a watertight and weathertight exterior building envelope.
5. Inspect and discuss the condition of substrate and other preparatory work performed by other trades.

#### 1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, glazing and fabrication methods, dimensions of individual components and profiles, hardware, and finishes for aluminum windows.

B. Shop Drawings: Include plans, elevations, sections, hardware, accessories, insect screens, operational clearances, operational limitations and details of installation, including anchor, flashing, sealant installation.

- C. Provide an electronic copy of manufacturer's standard installation instructions for all systems to be installed on the project.
- D. Samples for Initial Selection: For units with factory-applied color finishes.
  - 1. Include similar Samples of hardware and accessories involving color selection.
- E. Samples for Verification: For aluminum windows and components required, showing full range of color variations for finishes, and prepared on Samples of size indicated below:
  - 1. Exposed Finishes: 2 by 4 inches.
  - 2. Exposed Hardware: Full-size units.
- F. Product Schedule: For aluminum windows. Use same designations indicated on Drawings.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer and Installer.
- B. Product Test Reports: For each type of aluminum window, for tests performed by a qualified testing agency.
- C. Certificates. For glazing assemblies, certifying that they comply with ANSI Z97.1.
- D. Sample Warranties: For manufacturer's warranties.

#### 1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A manufacturer capable of fabricating aluminum windows that meet or exceed performance requirements indicated and of documenting this performance by test reports, and calculations.
- B. Installer Qualifications: An installer acceptable to aluminum window manufacturer for installation of units required for this Project.
- C. Substitution Limitations: Proposed substitutions for specified aluminum window systems must be approved in writing by Architect prior to bidding.
- D. Envelope Mock-ups: Comply with requirements in Section 01 4000 "Quality Requirements" for envelope mockup and testing requirements.
  - 1. Include typical system in mock-up as indicated on drawings.
  - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

## 1.6 WARRANTY

- A. **Manufacturer's Warranty:** Manufacturer agrees to repair or replace aluminum windows that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Failure to meet performance requirements.
    - b. Structural failures including excessive deflection, water leakage, condensation, and air infiltration.
    - c. Faulty operation of movable sash and hardware.
    - d. Deterioration of materials and finishes beyond normal weathering.
    - e. Failure of glazing.
  - 2. **Warranty Period:**
    - a. Window: 10 years from date of Substantial Completion.
    - b. Glazing Units: Five years from date of Substantial Completion.
    - c. Aluminum Finish: 10 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. **Source Limitations:** Obtain each type of aluminum window from single source from single manufacturer.

### 2.2 EXTERIOR WINDOW PERFORMANCE REQUIREMENTS

- A. **Product Standard:** Comply with AAMA/WDMA/CSA 101/I.S.2/A440-08 for definitions and minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.
  - 1. **Window Certification:** AMMA certified with label attached to each window.
- B. **Performance Class and Grade:** AAMA/WDMA/CSA 101/I.S.2/A440 as follows:
  - 1. **Minimum Performance Class:** AW Performance Class Windows Minimum Performance Grade: 40.
- C. **Air Test Performance Requirements:**
  - 1. Air infiltration and exfiltration maximum 0.1 cfm per square foot at 6.24 psf pressure differential when tested in accord with ASTM E283.
- D. **Condensation-Resistance Factor (CRF):** Provide aluminum windows tested for thermal performance according to AAMA 1503, showing a CRF of 52.

- E. Thermal Movements: Provide aluminum windows, including anchorage, 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 joint sealants, 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: 120 deg F, ambient; 180 deg F material surfaces.

### 2.3 EXTERIOR PSYCHIATRIC ALUMINUM WINDOWS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide **Wausau 4000i-DT** or equivalent window approved in writing by Architect prior to bidding from one of the following manufacturers.
  - 1. Moduline Window System
  - 2. Manko Window System, Inc.
- B. Frames & Sashes: Aluminum extrusions complying with AAMA/WDMA/CSA 101/I.S.2/A440.
  - 1. Thermally Improved Construction: Fabricate frames, sashes, and muntins with an integral, concealed, low-conductance thermal barrier located between exterior materials and window members exposed on interior side in a manner that eliminates direct metal-to-metal contact.
- C. Glazing Systems: As specified in Section "08 8000 Glazing". Use Manufacturer's standard factory-glazing system that produces weathertight seal.
  - 1. Safety Glazing: Provide glazing that complies with ANSI Z97.1.
- D. Hardware, General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, carbon steel complying with AAMA 907, or other corrosion-resistant material compatible with adjacent materials; designed to smoothly operate, tightly close, and securely lock windows, and sized to accommodate sash weight and dimensions.
  - 1. Provide tamper-resistant locks with keys that are nonremovable in unlocked position.
  - 2. Provide two die cast concealed hinge pins, retained in injection molded nylon hinge blocks at sill and spring steel hinge clips at head.
  - 3. Exposed Hardware Color and Finish: As selected by Architect from manufacturer's full range.
  - 4. Locate tilt-control knob on interior face and incorporate a "slip clutch" feature. Raise and lower pull cords will be located between glass for access only when access ventilator is opened.
- E. Weather Stripping: Provide full-perimeter weather stripping for each operable sash unless otherwise indicated. Use dual durometer PVC, neoprene, EPDM or other suitable material as tested and approved by the window manufacturer.

- F. Fasteners: Noncorrosive and compatible with window members, trim, hardware, anchors, and other components.
  - 1. Exposed Fasteners: Do not use exposed fasteners. For application of hardware, use fasteners that match finish hardware being fastened.
- G. Accessories:
  - 1. Horizontal Louver Blinds: Provide manufacturer's standard, removable, horizontal louver blinds with aluminum slats and polyester fiber cords that are operated by hardware located on inside face of sash.
    - a. Operation: Tilt only.
    - b. Color: As selected by Architect from manufacturer's full range.
    - c. Do not provide blinds or tilt-control knobs at retrofit windows.
  - 2. Subsills/receptors: Thermally broken, extruded-aluminum subsills in configurations indicated on Drawings.

#### 2.4 SLIDING INTERIOR ALUMINUM WINDOWS

- A. Interior Sliding Window Manufacturers: Subject to compliance with requirements, provide product by one of the following manufacturers.
  - 1. EFCO Corporation; a Pella company.
  - 2. Fleetwood Windows & Doors.
  - 3. Graham Architectural Products Corp.
  - 4. Kawneer North America; an Alcoa company.
  - 5. Manko Window System, Inc.
  - 6. Marvin Windows.
  - 7. Peerless Products Inc.
  - 8. Wausau Window and Wall Systems.
- B. Operating Types: Provide the following operating types in locations indicated on Drawings:
  - 1. Horizontal sliding.
- C. Frames & Sashes: Aluminum extrusions complying with AAMA/WDMA/CSA 101/I.S.2/A440.
- D. Glazing Systems: As specified in Section 08 8000 "Glazing". Use Manufacturer's standard factory-glazing system that produces weathertight seal.
- E. Hardware, General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, carbon steel complying with AAMA 907, or other corrosion-resistant material compatible with adjacent materials; designed to smoothly operate, tightly close, and securely lock windows, and sized to accommodate sash weight and dimensions.
  - 1. Provide tamper-resistant locks with keys that are nonremovable in unlocked position.

2. Exposed Hardware Color and Finish: As selected by Architect from manufacturer's full range.

F. Horizontal-Sliding Window Hardware:

1. Sill Cap/Track: Extruded-aluminum track with natural anodized finish, of dimensions and profile indicated.
2. Locks and Latches: Allow unobstructed movement of the sash across adjacent sash in direction indicated and operated from the inside only. Provide custodial locks.
3. Roller Assemblies: Low-friction design.

G. Fasteners: Noncorrosive and compatible with window members, trim, hardware, anchors, and other components.

1. Exposed Fasteners: Do not use exposed fasteners. For application of hardware, use fasteners that match finish hardware being fastened.

H. Accessories:

1. Subsills: Nonthermal, extruded-aluminum subsills in configurations indicated on Drawings.

## 2.5 FABRICATION

- A. Fabricate aluminum windows in sizes indicated. Include a complete system for assembling components and anchoring windows.
- B. Glaze aluminum windows in the factory.
- C. Weep Holes: For exterior windows, provide weep holes and internal passages to conduct infiltrating water to exterior.
- D. Miter all frame corners and mechanically stake over a solid extruded aluminum corner block, set and sealed in epoxy; or miter and weld each corner; then seal airtight.
- E. Complete fabrication, assembly, finishing, hardware application, and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation.

## 2.6 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual" 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.

## 2.7 ALUMINUM FINISHES

- A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- B. High-Performance Organic Finish (Two-Coat Fluoropolymer): AA-C12C40R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: conversion coating; Organic Coating: manufacturer's standard two-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 2605 and with coating and resin manufacturers' written instructions.
  - 1. Color and Gloss: Match color of curtainwall framing.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Verify rough opening dimensions, levelness of sill plate, and operational clearances.
- C. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure weathertight window installation.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components. For installation procedures and requirements not addressed in manufacturer's written instructions, comply with installation requirements in AAMA IPCB-08
- B. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction to produce weathertight construction.

- C. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.
- D. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

### 3.3 FIELD QUALITY CONTROL

- A. Refer to specification section 01 4000 for field quality and required field testing information.

### 3.4 ADJUSTING, CLEANING, AND PROTECTION

- A. Clean exposed surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.
  - 1. Keep protective films and coverings in place until final cleaning.
- B. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.
- C. Protect window surfaces from contact with contaminating substances resulting from construction operations. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written instructions.

END OF SECTION 08 5113

## SECTION 08 7100 - 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. Section includes:

- 1. Mechanical door hardware for the following:
  - a. Swinging doors.
  - b. Fire-rated swinging doors.
  - c. Other doors to the extent indicated.
- 2. Low-energy, power-operators.
- 3. Cylinders for door hardware specified in other Sections.
- 4. Electrified door hardware.

- B. Related Sections:

- 1. Section 06 4116 "Plastic-Laminate-Faced Architectural Cabinets" for cabinet door hardware provided as part of architectural woodwork.
- 2. Section 08 1113 "Hollow Metal Doors and Frames" and for door silencers provided as part of hollow-metal frames.
- 3. Section 08 3113 "Access Doors and Frames" for access door hardware, except cylinders.
- 4. Section 08 3326 "Overhead Coiling Grilles" for door hardware provided as part of overhead grille assemblies.
- 5. Section 08 4113 "Aluminum-Framed Entrances and Storefronts" for installation of 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. Thresholds, weather stripping, and cylinders for locks specified in other Sections.

#### 1.3 PREINSTALLATION CONFERENCE

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

1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Inspect and discuss preparatory work performed by other trades.
3. Inspect and discuss electrical roughing-in for electrified door hardware.
4. Review sequence of operation for each type of electrified door hardware.
5. Review required testing, inspecting, and certifying procedures.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction and installation details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: Details of electrified door hardware, indicating the following:
  1. Wiring Diagrams: For power, signal, and control wiring and including the following:
    - a. Details of interface of electrified door hardware and building safety and security systems.
    - b. Schematic diagram of systems that interface with electrified door hardware.
    - c. Point-to-point wiring.
    - d. Risers.
    - e. Elevations doors controlled by electrified door hardware.
  2. Operation Narrative: Describe the operation of doors controlled by electrified door hardware.
- C. Samples for Verification: For exposed door hardware of each type, in specified finish, full size. Tag with full description for coordination with the door hardware sets. Submit Samples before, or concurrent with, submission of the final door hardware sets, if requested.
  1. Full-size Samples will be returned to Contractor. Units that are acceptable and remain undamaged through submittal, review, and field comparison process may, after final check of operation, be incorporated into the Work, within limitations of keying requirements.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and Architectural Hardware Consultant.
- B. Product Certificates: For electrified door hardware, from the manufacturer.
  1. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.
- C. Product Test Reports: For compliance with accessibility requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for door hardware on doors located in accessible routes.

- D. Maintenance Data: For each type of door hardware to include in maintenance manuals. Include final hardware schedule.
- E. 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.
  - 1. Submittal Sequence: Submit door hardware schedule concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate the fabrication of other work that is critical in Project construction schedule.
  - 2. Format: Use same scheduling sequence and format and use same door numbers as in the Contract Documents.
  - 3. Content: Include the following information:
    - a. Identification number, location, hand, fire rating, size, and material of each door and frame.
    - b. Locations of each door hardware set, cross-referenced to Drawings on floor plans and to door and frame schedule.
    - c. Complete designations, including name and manufacturer, type, style, function, size, quantity, function, and finish of each door hardware product.
    - d. Description of electrified door hardware sequences of operation and interfaces with other building control systems.
    - e. Fastenings and other pertinent information.
    - f. Explanation of abbreviations, symbols, and codes contained in schedule.
    - g. Mounting locations for door hardware.
    - h. List of related door devices specified in other Sections for each door and frame.
- F. Keying Schedule: Prepared by or under the supervision of Installer, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations that are coordinated with the Contract Documents.

#### 1.6 CLOSEOUT SUBMITTALS

- A. Warranty: Special warranty specified in this Section.

#### 1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish full-size units of door hardware 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. Door Hardware:
    - a. 1 ea. VON 98L X 626.
    - b. 1 ea. VON 050046

- c. 1 ea. SCH LV9080R EV 29 X 626.
- d. 1 ea SCH 40-054
- e. 1 ea. LCN 4111 HEDA TBWMS 689.
- f. 1 ea Sitemaster 200 Key Management System

## 1.8 QUALITY ASSURANCE

- A. **Installer Qualifications:** Supplier of products and an employer of workers trained and approved by product manufacturers and an Architectural Hardware Consultant who is available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.
  - 1. Installer's responsibilities include supplying and installing door hardware and providing a qualified Architectural Hardware Consultant available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.
  - 2. Warehousing Facilities: In Project's vicinity.
  - 3. Scheduling Responsibility: Preparation of door hardware and keying schedules.
  - 4. Engineering Responsibility: Preparation of data for electrified door hardware, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
- B. **Architectural Hardware Consultant Qualifications:** A person who is currently certified by DHI as an Architectural Hardware Consultant and who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project.
- C. **Source Limitations:** Obtain each type of door hardware from a single manufacturer.
  - 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.
- D. **Fire-Rated Door Assemblies:** Where fire-rated door assemblies are indicated, provide door hardware rated for use in assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C, unless otherwise indicated.
- E. **Smoke- and Draft-Control Door Assemblies:** Where smoke- and draft-control door assemblies are required, provide door hardware that meet requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
  - 1. Air Leakage Rate: Maximum air leakage of 0.3 cfm/sq. ft. at the tested pressure differential of 0.3-inch wg of water.
- F. **Electrified Door Hardware:** Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.

- G. Means of Egress Doors: Latches do not require more than 15 lbf to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.
- H. Accessibility Requirements: For door hardware on doors in an accessible route, comply with the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines.
  - 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.
  - 2. Comply with the following maximum opening-force requirements:
    - a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf applied perpendicular to door.
    - b. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
  - 3. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch high.
  - 4. Adjust door closer sweep periods 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.

#### 1.9 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 Owner's Representative by registered mail or overnight package service.

#### 1.10 COORDINATION

- A. Coordinate layout and installation of recessed hardware with floor construction. Cast anchoring inserts into concrete. Concrete, reinforcement, and formwork requirements are specified in Division 03.
- B. 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.
- C. Coordinate with aluminum entrance door supplier for door hardware installation.
- D. Electrical System Roughing-in: Coordinate layout and installation of electrified door hardware with connections to power supplies, fire alarm system and detection devices, access control system, security system, and building control system.

## 1.11 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 doors and door hardware.
    - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
  - 2. Warranty Period: Three years from date of Substantial Completion, unless otherwise indicated.
    - a. Exit Devices: Two years from date of Substantial Completion.
    - b. Manual Closers: 10 years from date of Substantial Completion.
    - c. Automatic Door Operators: Two years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 SCHEDULED DOOR HARDWARE

- A. Provide door hardware for each door as scheduled in Part 3 "Door Hardware Schedule" Article to comply with requirements in this Section.
  - 1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and 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.
- 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 Schedule" Article. Products are identified by using door hardware designations, as follows:
  - 1. Named Manufacturers' Products: Manufacturer and product designation are listed for each door hardware type required for the purpose of establishing minimum requirements. Manufacturers' names are abbreviated in Part 3 "Door Hardware Schedule" Article.
  - 2. References to BHMA Designations: Provide products complying with these designations and requirements for description, quality, and function.

### 2.2 HINGES

- A. Hinges: BHMA A156.1. Provide template-produced hinges for hinges installed on hollow-metal doors and hollow-metal frames.

1. Basis-of-Design Product: Subject to compliance with requirements, provide scheduled **Ives Hardware** product indicated on schedule or comparable product, approved in writing by Architect prior to bidding, by one of the following:
  - a. Hager Companies.
  - b. McKinney Products Company; an ASSA ABLOY Group company.
  - c. Stanley Commercial Hardware; Div. of The Stanley Works.

## 2.3 OFFSET PIVOTS

### A. Offset Pivots: BHMA A156.4.

1. Basis-of-Design Product: Subject to compliance with requirements, provide **Ives Hardware** product scheduled or comparable product, approved in writing by Architect prior to bidding, by one of the following:
  - a. DORMA Architectural Hardware; Member of The DORMA Group North America.
  - b. Rixson Specialty Door Controls; an ASSA ABLOY Group company.

## 2.4 CONTINUOUS HINGES

### A. Continuous Hinges: BHMA A156.26; minimum 0.120-inch- thick, hinge leaves with minimum overall width of 4 inches; fabricated to full height of door and frame and to template screw locations; with components finished after milling and drilling are complete.

### B. Pin-and-Barrel-Type Hinges:

1. Basis-of-Design Product: Subject to compliance with requirements, provide **Ives Hardware** product scheduled or comparable product, approved in writing by Architect prior to bidding, by one of the following:
  - a. Hager Companies.
  - b. Markar Architectural Products, Inc.; a subsidiary of Adams Rite Manufacturing Co.
  - c. McKinney Products Company; an ASSA ABLOY Group company.

### C. Continuous, Gear-Type Hinges: Extruded-aluminum, pinless, geared hinge leaves joined by a continuous extruded-aluminum channel cap; with concealed, self-lubricating thrust bearings.

1. Basis-of-Design Product: Subject to compliance with requirements, provide **Ives Hardware** product scheduled or comparable product, approved in writing by Architect prior to bidding, by one of the following:
  - a. Hager Companies.
  - b. Markar Architectural Products, Inc.; a subsidiary of Adams Rite Manufacturing Co.

- c. McKinney Products Company; an ASSA ABLOY Group company.
- d. Select Products Limited.

## 2.5 MECHANICAL LOCKS AND LATCHES

- A. Lock Functions: As indicated in door hardware schedule.
  1. Mortise Locks: BHMA A156.13.
  2. Multiple-Point Deadbolts: Minimum 1-inch bolt throw.
- B. 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.
- C. Lock Backset: 2-3/4 inches, unless otherwise indicated.
- D. Lock Trim:
  1. Description: Match existing levers.
  2. Levers: Cast.
  3. Escutcheons (Roses): Wrought.
  4. Dummy Trim: Match lever lock trim and escutcheons.
  5. Operating Device: Lever with escutcheons (roses).
- E. Strikes: Provide manufacturer's standard strike for each lock bolt or latchbolt complying with requirements indicated for applicable lock or latch and with strike box and curved lip extended to protect frame; finished to match lock or latch.
  1. Aluminum-Frame Strike Box: Manufacturer's special strike box fabricated for aluminum framing.
  2. Rabbet Front and Strike: Provide on locksets for rabbeted meeting stiles.
- F. Mortise Locks: BHMA A156.13; Security Grade 1; stamped steel case with steel or brass parts; Series 1000.
  1. Basis-of-Design Product: Subject to compliance with requirements, provide scheduled **Schlage** product indicated or equivalent product, approved in writing by Architect prior to bidding, by another manufacturer.
- G. Anti-Ligature Locks: BHMA A156.13; Security Grade 1; stamped steel case with steel or brass parts; Series 1000.
  1. Basis-of-Design Product: Subject to compliance with requirements, provide scheduled **Schlage** product indicated or equivalent product, approved in writing by Architect prior to bidding, by another manufacturer.

- H. Occupancy Indicators: Provide product integral with lock.
  - 1. Restroom Displays: Display “OCCUPIED” plate when lock or deadbolt is thrown.
  - 2. Privacy Display: Display “DO NOT DISTURB” plate when deadbolt is thrown.

## 2.6 ELECTRIC STRIKES

- A. Electric Strikes: BHMA A156.31; Grade 1; with faceplate to suit lock and frame.
  - 1. Basis-of-Design Product: Subject to compliance with requirements, provide scheduled **Von Duprin** product indicated on schedule or comparable product, approved in writing by Architect prior to bidding, by one of the following:
    - a. Security Door Controls.
    - b. HES; an ASSA ABLOY Group company.

## 2.7 ELECTROMAGNETIC LOCKS

- A. Electromagnetic Locks: BHMA A156.23; electrically powered; with electromagnet attached to frame and armature plate attached to door; full-exterior or full-interior type, required by application indicated. Provide extra-wide housing that extends to full width of door.
  - 1. Basis-of-Design Product: Subject to compliance with requirements, provide products indicated on schedule or equivalent product, approved in writing by Architect prior to bidding, from another manufacturer.

## 2.8 ELECTROMECHANICAL LOCKS

- A. Electromechanical Locks: BHMA A156.25; Grade 1; motor or solenoid driven; mortise deadlocking latchbolt; with strike that suits frame.
  - 1. Basis-of-Design Product: Subject to compliance with requirements, provide scheduled product or equivalent product, approved in writing by Architect prior to bidding, from another manufacturer.

## 2.9 MANUAL FLUSH BOLTS

- A. Manual Flush Bolts: BHMA A156.16; minimum 3/4-inch throw; designed for mortising into door edge. Include manufacturer’s dustproof strike.
  - 1. Basis-of-Design Product: Subject to compliance with requirements, provide scheduled **Ives Hardware** product indicated on schedule or comparable product, approved in writing by Architect prior to bidding, by one of the following:
    - a. Adams Rite Manufacturing Co.; an ASSA ABLOY Group company.
    - b. Trimco.

2.10 AUTOMATIC FLUSH BOLTS

- A. Automatic Flush Bolts: BHMA A156.16; minimum 3/4-inch throw; designed for mortising into door edge. Include manufacturer's dustproof strike.
  - 1. Basis-of-Design Product: Subject to compliance with requirements, provide scheduled **Ives Hardware** product indicated on schedule or comparable product, approved in writing by Architect prior to bidding, by one of the following:
    - a. Trimco.

2.11 EXIT DEVICES

- A. Exit Devices: BHMA A156.3.
  - 1. Basis-of-Design Product: Subject to compliance with requirements, provide products indicated on schedule by **Von Duprin; an Ingersoll-Rand Company** or equivalent products complying with requirements and approved in writing by Architect prior to bid, by another manufacturer.
- B. Removable Mullions: BHMA A156.3.
- C. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
  - 1. Operation: Movable with monitor switch when required.

2.12 LOW-ENERGY, POWER DOOR OPERATORS

- A. General: Provide operators of size recommended by manufacturer for door size, weight, and movement; for condition of exposure; and for long-term, maintenance-free operation under normal traffic load for type of occupancy indicated.
  - 1. Basis-of-Design Product: Subject to compliance with requirements, provide scheduled **Ives Hardware** products or equivalent products complying with requirements and approved in writing by Architect prior to bid.
- B. Housing: Fabricated from minimum 0.125-inch- thick extruded or formed aluminum.
  - 1. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated, complying with standards indicated below:
    - a. Sheet: ASTM B 209.
    - b. Extrusions: ASTM B 221.
- C. Exposed Cover: Fabricated from 0.125-inch- thick extruded aluminum; with enclosed end caps, provision for maintenance access, and fasteners concealed when door is in closed position.
  - 1. Finish: Match door and frame.

2. Color: As selected by Architect from manufacturer's full range.
- D. Standard: Comply with BHMA A156.19.
- E. Performance Requirements:
  1. Not more than 15 lbf 1 inch from latch edge of door to prevent stopped door from opening or closing.
  2. If power fails, not more than 30 lbf 1 inch from latch edge of door to manually set door in motion.
- F. Operation: Power opening and power-assisted spring closing.
  1. Power-Assisted Opening: Power-assisted opening that reduces force to open self-closing door. Pushing or pulling on door activates automatic door operator.
- G. Operating System: Electromechanical.
- H. Features:
  1. Adjustable opening and closing speed.
  2. Adjustable opening force.
  3. Adjustable backcheck.
  4. Adjustable latch speed.
  5. Adjustable hold-open time of not less than 0 to 30 seconds.
  6. Adjustable time delay.
  7. Adjustable acceleration.
  8. Obstruction recycle.
- I. Mounting: Stainless Steel Pedestal Mount at Exterior Doors, Surface Pull side at interior doors
- J. Low-Energy Automatic Door Operator Signage: Comply with BHMA A156.19.
- K. Aluminum Finishes:
  1. Powder-Coat Finish: Apply manufacturer's standard powder coating complying with manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness.
  2. Color and Gloss: As selected by Architect from manufacturer's full range.

## 2.13 LOCK CYLINDERS

- A. Lock Cylinders: Tumbler type, constructed from brass or bronze, stainless steel, or nickel silver.
  1. Basis-of-Design Product: Subject to compliance with requirements, provide scheduled **Schlage Lock** products scheduled or equivalent product complying with requirements and approved in writing by Architect prior to bid.

- B. Standard Lock Cylinders: BHMA A156.5; Grade 1; permanent cores that are interchangeable; face finished to match lockset.
- C. High-Security Lock Cylinders: BHMA A156.30; Grade 1; Type M, mechanical; permanent cores that are removable; face finished to match lockset.
- D. Construction Master Keys: Provide cylinders with feature that permits voiding of construction keys without cylinder removal. Provide 10 construction master keys.
- E. Construction Cores: Provide construction cores that are replaceable by permanent cores. Provide 10 construction master keys.

#### 2.14 KEYING

- A. General: Review keying system with Owner and provide a master, grandmaster or great-grandmaster integrated with Owner's existing system. If key pinning charts are required, Owner to furnish charts to hardware supplier.
- B. Keying System: Factory registered, complying with guidelines in BHMA A156.28, Appendix A. Incorporate decisions made in keying conference.
  - 1. No Master Key System: Only change keys operate cylinder.
  - 2. Master Key System: Change keys and a master key operate cylinders.
  - 3. Grand Master Key System: Change keys, a master key, and a grand master key operate cylinders.
  - 4. Great-Grand Master Key System: Change keys, a master key, a grand master key, and a great-grand master key operate cylinders.
  - 5. Existing System:
    - a. Master key or grand master key locks to Owner's existing system.
  - 6. Keyed Alike: Key all cylinders to same change key.
- C. Keys: Brass.
  - 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.
    - c. Grand Master Keys: Five.
    - d. Great-Grand Master Keys: Five.

2.15 KEY CONTROL SYSTEM

- A. Key Control Cabinet: BHMA A156.5; 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. Provide key cabinet and system as a part of this hardware supplier contract. Cabinet shall be indexed and set up by supplier with the Owner's representative.

2.16 OPERATING TRIM

- A. Operating Trim: BHMA A156.6; stainless steel, unless otherwise indicated.
  - 1. Basis-of-Design Product: Subject to compliance with requirements, provide scheduled **Ives Hardware** products indicated on schedule or comparable product, approved in writing by Architect prior to bidding, by one of the following:
    - a. Hager Companies.
    - b. Trimco.
    - c. Rockwood Manufacturing Company.

2.17 ACCESSORIES FOR PAIRS OF DOORS

- A. Coordinators: BHMA A156.3; consisting of active-leaf, hold-open lever and inactive-leaf release trigger; fabricated from steel with nylon-coated strike plates; with built-in, adjustable safety release; and with internal override. Provide indicated coordinators or equivalent approved by Architect prior to bid and complying with requirements.
- B. Astragals: BHMA A156.22.

2.18 SURFACE 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.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following which has been approved as sole source product by DFCM:
    - a. LCN Closers; an Ingersoll-Rand company.

## 2.19 CONCEALED CLOSERS

- A. Concealed Closers: BHMA A156.4; rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves. 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. Basis-of-Design Product: Subject to compliance with requirements, provide scheduled product by **LCN Closers** indicated or comparable product, approved in writing by Architect prior to bidding, by one of the following:
    - a. DORMA Architectural Hardware; Member of The DORMA Group North America.
    - b. Rixson Specialty Door Controls; an ASSA ABLOY Group company.
    - c. SARGENT Manufacturing Company; an ASSA ABLOY Group company.

## 2.20 MECHANICAL STOPS AND HOLDERS

- A. Wall- and Floor-Mounted Stops: BHMA A156.16; polished cast brass, bronze, or aluminum base metal.
1. Basis-of-Design Product: Subject to compliance with requirements, provide scheduled products or comparable product, approved in writing by Architect prior to bidding, by one of the following:
    - a. Hager Companies.
    - b. LCN Closers
    - c. Quality Door Hardware.
    - d. Rockwood Manufacturing Company.
- B. 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.
1. Provide product indicated in schedule or equivalent product, approved in writing by architect prior to bidding, by another manufacturer.

## 2.21 ELECTROMAGNETIC STOPS AND HOLDERS

- A. Electromagnetic Door Holders: BHMA A156.15, Grade 1; wall-mounted electromagnetic single unit with strike plate attached to swinging door; coordinated with fire detectors and interface with fire alarm system for labeled fire-rated door assemblies.
1. Coordinate with security systems.
  2. Basis-of-Design Product: Subject to compliance with requirements, provide scheduled **LCN Closers** product indicated on schedule or comparable product, approved in writing by Architect prior to bidding, by one of the following:

- a. Architectural Builders Hardware Mfg., Inc.
- b. DORMA Architectural Hardware; Member of The DORMA Group North America.
- c. Rixson Specialty Door Controls; an ASSA ABLOY Group company.

## 2.22 OVERHEAD STOPS AND HOLDERS

### A. Overhead Stops and Holders: BHMA A156.8.

1. Basis-of-Design Products: Subject to compliance with requirements, provide scheduled **Glynn Johnson** products indicated on schedule or comparable product, approved in writing by Architect prior to bidding, by one of the following:
  - a. Architectural Builders Hardware Mfg., Inc.
  - b. SARGENT Manufacturing Company; an ASSA ABLOY Group company
  - c. Rixon Specialty Door Controls; an ASSA ABLOY Group company.

## 2.23 DOOR GASKETING

### A. Door Gasketing: BHMA A156.22; air leakage not to exceed 0.50 cfm per foot of crack length for gasketing other than for smoke control, as tested according to ASTM E 283; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.

1. Basis-of-Design Products: Subject to compliance with requirements, provide scheduled **National Guard Products** products indicated on schedule or comparable product, approved in writing by Architect prior to bidding, by one of the following:
  - a. Pemko Manufacturing Co.; an ASSA ABLOY Group company.
  - b. Zero International.
2. Use manufacturer's standard threshold where indicated in hardware schedule.

## 2.24 THRESHOLDS

### A. Thresholds: BHMA A156.21; fabricated to full width of opening indicated.

1. Basis-of-Design Products: Subject to compliance with requirements, provide scheduled **National Guard Products** products indicated on schedule or comparable product, approved in writing by Architect prior to bidding, by one of the following:
  - a. Pemko Manufacturing Co.; an ASSA ABLOY Group company.
  - b. Zero International.
2. Use manufacturer's standard threshold where indicated in hardware schedule.

## 2.25 METAL PROTECTIVE TRIM UNITS

- A. Metal Protective Trim Units: BHMA A156.6; fabricated from 0.050-inch- thick stainless steel; with manufacturer's standard machine or self-tapping screw fasteners.
  - 1. Basis-of-Design Products: Subject to compliance with requirements, provide scheduled **Ives Hardware** products indicated on schedule or comparable product, approved in writing by Architect prior to bidding, by one of the following:
    - a. Hager Companies.
    - b. Quality Door Hardware.
    - c. Rockwood Manufacturing Company.
- B. Full Length Cover Plates: Fabricated from 0.050-inch- thick stainless steel, on in-active leaf to finish and form jamb/latch at pair of doors where scheduled. Attach with countersunk tamper proof screws.
- C. Full Width Cover Plates: Fabricated from 0.050-inch- thick stainless steel, on head of active leaf at pair of doors where scheduled. Attach with countersunk tamper proof screws.

## 2.26 ACTIVATION AND SAFETY DEVICES

- A. Wall-Mount Push-Plate Actuator Switch: Manufacturer's standard semiflush, wall-mounted, door control switch; consisting of square, flat push plate; of material indicated; and actuator mounted in recessed junction box. Provide engraved message as indicated.
  - 1. Material: Stainless steel.
  - 2. Message: International symbol of accessibility and "Push to Open".
  - 3. Basis-of-Design Products: Subject to compliance with requirements, provide scheduled **LCN Closers** actuator product indicated on schedule or comparable product, compatible with system and approved in writing by Architect prior to bidding, by another manufacturer.
- B. Wireless Wall-Mount Push-Plate Actuator Switch: Manufacturer's standard semiflush, wall-mounted, door control switch; consisting of round or square, flat push plate; of material indicated; and actuator mounted in recessed junction box. Provide engraved message as indicated.
  - 1. Material: Stainless steel.
  - 2. Message: International symbol of accessibility and "Push to Open."
  - 3. Wireless or Remote Radio Control: Manufacturer's standard radio control consisting of a receiver and battery-operated transmitters of the following type:
    - a. Transmitter Type: Wall mounted with push plate.
  - 4. Basis-of-Design Products: Subject to compliance with requirements, provide scheduled **LCN Closers** actuator product indicated on schedule or comparable product, compatible

with system and approved in writing by Architect prior to bidding, by another manufacturer.

- C. Heavy-Duty Wall-Mount Push-Button Switch: Manufacturer's standard surface-mounted, door control switch; consisting of round aluminum push button; of material indicated; and actuator mounted in recessed junction box. Provide engraved message as indicated.
1. Material: Stainless steel plate with aluminum push button.
  2. Message: "Push to Exit."
  3. Basis-of-Design Products: Subject to compliance with requirements, provide scheduled **Schlage Electronics (Locknetics)** product indicated on schedule or comparable product, compatible with system and approved in writing by Architect prior to bidding, by another manufacturer.
- D. Infrared Motion Detector: Self-contained presence detector consisting of an infrared-scanner sensing device to activate door operator. Sensing device shall be adjustable to provide detection patterns and sensitivity equivalent to those required for control mats. Provide metal or plastic housing with black finish for sensing device.
1. Basis-of-Design Products: Subject to compliance with requirements, provide scheduled product or equivalent product, compatible with system and approved in writing by Architect prior to bidding, by another manufacturer.
- E. Key Switch: Manufacturer's standard wall-mounted, door control keyed maintained-action bi-directional switch; consisting of square plate of material indicated.
1. Material: Stainless steel.
  2. Basis-of-Design Products: Subject to compliance with requirements, provide scheduled **Schlage, an Ingersoll-Rand company** product indicated on schedule or comparable product, compatible with system and approved in writing by Architect prior to bidding, by another manufacturer.
- F. Proximity Reader: Reader and power supply as specified in Division 28 section.

## 2.27 ELECTRICAL HARDWARE

- A. Furnish wiring diagrams to electrical contractor for use in installing electrical hardware products.
- B. Electrical contractor to run all wiring and make all final connections for electrified hardware. Hardware supplier shall be responsible to furnish all wiring diagrams to operate electrified hardware. Access control material and electrified hardware to interface at junction boxes.
- C. Electrical Interlocks: Unless units are equipped with self-protecting devices or circuits, provide electrical interlocks to prevent activation of operator when door is locked, latched, or bolted

2.28 AUXILIARY DOOR HARDWARE

- A. Wardrobe Hooks: Provide double coat and hat hooks as scheduled.
  - 1. Basis-of-Design Products: Subject to compliance with requirements, provide scheduled **Ives Hardware** product indicated on schedule or comparable product, compatible with system and approved in writing by Architect prior to bidding, by another manufacturer.
  - 2. Do not provide wardrobe hooks in Pediatric Building.
- B. Lock Guards: Provide steel device designed to straddle frame and door edge, concealing fasteners on the secure side of the door.
  - 1. Basis-of-Design Products: Subject to compliance with requirements, provide scheduled **Ives Hardware** product or comparable product, compatible with locking system and approved in writing by Architect prior to bidding, by another manufacturer.

2.29 AUXILIARY ELECTRIFIED DOOR HARDWARE

- A. Boxed Power Supplies: Modular unit in NEMA ICS 6, Type 4 enclosures; filtered and regulated; voltage rating and type matching requirements of door hardware served; and listed and labeled for use with fire alarm systems. Provide indicated power supply or equivalent approved by Architect prior to bid and complying with requirements.
- B. Electric Power Transfer: Provide means of transferring electrical power from a door frame to the edge of a swinging door where indicated. Units are to be completely concealed when door is in the closed position, and are to be suitable for installations involving abuse or heavy traffic. Provide scheduled product or equivalent as provided by actual panic hardware manufacturer.
- C. Door Position Switches: Provide door position switches as scheduled and compatible with other hardware on door, designed for monitoring door positions.
  - 1. Basis-of-Design Products: Subject to compliance with requirements, provide scheduled product or equivalent product, compatible with system and approved in writing by Architect prior to bidding, by another manufacturer.

2.30 FABRICATION

- A. Base Metals: Produce door hardware units of base metal indicated, 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.
- B. Fasteners: Provide door hardware manufactured to comply with published templates prepared for machine, wood, and sheet metal screws. Provide screws that comply with 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. Fire-Rated Applications:
  - a. Machine Screws: For the following:
    - 1) Hinges mortised to doors or frames.
    - 2) Strike plates to frames.
    - 3) Closers to doors and frames.
  - b. Steel Through Bolts: For the following unless door blocking is provided:
    - 1) Surface hinges to doors.
    - 2) Closers to doors and frames.
    - 3) Surface-mounted exit devices.
3. Spacers or Sex Bolts: For through bolting of hollow-metal doors.
4. Gasketing Fasteners: Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.
5. Tamper-Proof Fasteners: In areas accessible to patients, use tamperproof fasteners for fastening products and materials.
  - a. Available Products: Tamperproof fasteners, screws and anchors as provided by Torx, Tamperproof Screw Company, McGard, or equivalent tamperproof fastener types approved by architect in writing prior to bidding.

## 2.31 FINISHES

- A. Provide finishes complying with BHMA A156.18 as indicated in door hardware schedule.
- 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.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated 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: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.
- B. Wood Doors: Comply with DHI WDHS.5 "Recommended Hardware Reinforcement Locations for Mineral Core Wood Flush Doors."

#### 3.3 INSTALLATION

- A. Mounting Heights: Mount door hardware units at heights to comply with the following unless otherwise indicated or required to comply with governing regulations.
  - 1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
  - 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. 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. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30 inches of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.

- D. Intermediate Offset Pivots: Where offset pivots are indicated, provide intermediate offset pivots in quantities indicated in door hardware schedule but not fewer than one intermediate offset pivot per door and one additional intermediate offset pivot for every 30 inches of door height greater than 90 inches.
- E. Lock Cylinders: Install construction cores to secure building and areas during construction period.
  - 1. Replace construction cores with permanent cores as directed by Owner.
  - 2. Furnish permanent cores to Owner for installation.
- F. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.
- G. Low-Energy Power Door Operator Installation Standard: Comply with BHMA A156.19 for installation.
  - 1. Install complete automatic door operator system, including activation and safety devices, control wiring, and remote power units.
  - 2. Automatic Door Operators: Install door operator system, including control wiring, as follows:
    - a. Refer to Division 26 Sections for connection to electrical power distribution system.
  - 3. Activation and Safety Devices: Install devices and wiring, including connections to automatic door operators, according to BHMA A156.10 and as follows:

Infrared-Scanner Presence Detectors: Install scanners on approach side of each door indicated to receive automatic door operators.

Wall Switches: Provide push plates on both sides of each opening indicated to receive automatic door operators.

Connect wiring according to Division 16 Section "Conductors and Cables.

Boxed Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings. Verify location with Architect.

Configuration: Provide least number of power supplies required to adequately serve doors with electrified door hardware.

Thresholds: Set thresholds for exterior doors and other doors indicated in full bed of sealant complying with requirements specified in Section 07 9200 "Joint Sealants."

Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they will impede traffic.

Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.

Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.

Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

#### FIELD QUALITY CONTROL

Independent Architectural Hardware Consultant: Owner will engage a qualified independent Architectural Hardware Consultant to perform inspections and to prepare inspection reports.

Independent Architectural Hardware Consultant will inspect door hardware and state in each report whether installed work complies with or deviates from requirements, including whether door hardware is properly installed and adjusted.

#### ADJUSTING

Initial Adjustment at installation: 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.

Spring Hinges: Adjust to achieve positive latching when door is allowed to close freely from an open position of 30 degrees.

Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.

Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.

Occupancy Adjustment: Approximately six months after date of Substantial Completion, Installer's Architectural Hardware Consultant shall examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors, door hardware, and electrified door hardware.

#### CLEANING AND PROTECTION

Clean adjacent surfaces soiled by door hardware installation.

Clean operating items as necessary to restore proper function and finish.

Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

#### DEMONSTRATION

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 Section 01 7900 "Demonstration and Training."

Provide hardware either from manufacture's scheduled or equivalent compatible products as selected from list of manufacturers specified herein and approved by architect prior to bidding.

#### MAINTENANCE SERVICE

Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

Maintenance Service: Beginning at Substantial Completion, provide six months' full maintenance by skilled employees of door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door and door hardware operation. Provide parts and supplies that are the same as those used in the manufacture and installation of original products.

DOOR HARDWARE SCHEDULE ( **PAYNE BUILDING** )

HW SET: 01 Payne Building

6	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
2	EA	MANUAL FLUSH BOLT	FB458	626	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	STOREROOM LOCK	LV9080R 06A EV 29	626	SCH
1	EA	ASTRAGAL	139A	600	NGP
2	EA	SURFACE CLOSER	4111 SHCUSH MC TBWMS	689	LCN
1	SET	SEALS	700SA (DO NOT CUT AROUND CLOSER BRACKET)	AL	NGP
2	EA	DOOR SWEEP	C627A	AL	NGP
1	EA	THRESHOLD	425HD	AL	NGP
2	EA	DOOR POSITION SWITCH	679-05		SCE
1	EA	MOTION DETECTOR	SCAN II-B (REQUEST TO EXIT)	BLK	SCE

INSTALL WEATHERSTRIP FIRST. DO NOT CUT AROUND CLOSER BRACKET. DOOR POSITION IS MONITORED BY ACCESS CONTROL SYSTEM. MOTION DETECTOR IS REX.

HW SET: 02 Payne Building

6	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
2	EA	MANUAL FLUSH BOLT	FB458	626	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	STOREROOM LOCK	LV9080R 06A EV 29	626	SCH
1	EA	ASTRAGAL	139A	600	NGP
2	EA	SURFACE CLOSER	4111 SHCUSH MC TBWMS	689	LCN
1	SET	SEALS	700SA (DO NOT CUT AROUND CLOSER BRACKET)	AL	NGP
2	EA	DOOR SWEEP	C627A	AL	NGP
1	EA	THRESHOLD	425HD	AL	NGP

INSTALL WEATHERSTRIP FIRST. DO NOT CUT AROUND CLOSER BRACKET.

HW SET: 03 Payne Building

3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	PANIC HARDWARE	98L-NL 996L	626	VON
1	EA	RIM CYLINDER	80-329 EV 29	626	SCH
1	EA	ELECTRIC STRIKE	6300 FSE	630	VON
1	EA	SURFACE CLOSER	4111 EDA MC TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
3	EA	SILENCER	SR64	GRY	IVE
1	EA	MOTION DETECTOR	SCAN II-B (REQUEST TO EXIT)	BLK	SCE
1			PROX READER AND POWER SUPPLY BY DIVISION		
			28		

CARD IN. USER PRESENTS CREDENTIAL, ELECTRIC STRIKE KEEPER RELEASES, USER OPENS DOOR TO ENTER. DOOR POSITION IS MONITORED BY SECURITY SYSTEM. MOTION DETECTOR IS REX.

HW SET: 04 Payne Building

3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	PANIC HARDWARE	98L-NL 996L	626	VON
1	EA	RIM CYLINDER	80-329 EV 29	626	SCH
1	EA	SURFACE CLOSER	4111 EDA MC TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	WALL STOP	WS407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 05 Payne Building

3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	PANIC HARDWARE	98EO	626	VON
1	EA	SURFACE CLOSER	4111 EDA MC TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	WALL STOP	WS407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 06 Payne Building

3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	PANIC HARDWARE	CD98L-NL 996L	626	VON
1	EA	MORTISE CYLINDER	20-001 EV 29	626	SCH
1	EA	RIM CYLINDER	80-329 EV 29	626	SCH
1	EA	SURFACE CLOSER	4111 HEDA MC TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	WALL STOP	WS407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 07 Payne Building

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	LV9080R 06A EV 29	626	SCH
1	EA	ELECTRIC STRIKE	6212 FSE 24VDC	630	VON
1	EA	SURFACE CLOSER	4010 MC TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	WALL STOP	WS407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE
1			PROX READER AND POWER SUPPLY BY DIVISION		
			28		

CARD IN. USER PRESENTS CREDENTIAL, ELECTRIC STRIKE KEEPER RELEASES, USER OPENS DOOR

TO ENTER. NO DPS, NO REX.

HW SET: 07.1 Payne Building

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	LV9080R 06A EV 29	626	SCH
1	EA	ELECTRIC STRIKE	6212 FSE 24VDC	630	VON
1	EA	SURFACE CLOSER	4010 MC TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	WALL STOP	WS407CCV	630	IVE
1	SET	SEALS	160S	AL	NGP
1			PROX READER AND POWER SUPPLY BY DIVISION		
			28		

CARD IN. USER PRESENTS CREDENTIAL, ELECTRIC STRIKE KEEPER RELEASES, USER OPENS DOOR TO ENTER. NO DPS, NO REX.

HW SET: 08 Payne Building

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	LV9080R 06A EV 29	626	SCH
1	EA	ELECTRIC STRIKE	6212 FSE 24VDC	630	VON
1	EA	SURFACE CLOSER	4010 MC TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	WALL STOP	WS407CCV	630	IVE
1	SET	SEALS	2525B	BRN	NGP
1	EA	DOOR BOTTOM	4440SA	CL	NGP
1			PROX READER AND POWER SUPPLY BY DIVISION		
			28		

CARD IN. USER PRESENTS CREDENTIAL, ELECTRIC STRIKE KEEPER RELEASES, USER OPENS DOOR TO ENTER. NO DPS, NO REX.

HW SET: 09 Payne Building

3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	STOREROOM LOCK	LV9080R 06A EV 29	626	SCH
1	EA	ELECTRIC STRIKE	6212 FSE 24VDC	630	VON
1	EA	SURFACE CLOSER	4111 EDA MC TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	WALL STOP	WS407CCV	630	IVE
1	EA	LOCK GUARD	LG12	630	IVE
3	EA	SILENCER	SR64	GRY	IVE
1			PROX READER AND POWER SUPPLY BY DIVISION		
			28		

CARD IN. USER PRESENTS CREDENTIAL, ELECTRIC STRIKE KEEPER RELEASES, USER OPENS DOOR TO ENTER. NO DPS, NO REX.

HW SET: 10 Payne Building

3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	STOREROOM LOCK	LV9080R 06A EV 29	626	SCH
1	EA	SURFACE CLOSER	4111 EDA MC TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	WALL STOP	WS407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 11 Payne Building

3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	STOREROOM LOCK	LV9080R 06A EV 29	626	SCH
1	EA	WALL STOP	WS407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 12 Payne Building

3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	MAG LOCK	MM15GDT E-MAG	630	SEC
1	EA	PUSH PLATE	8200 4" X 16"	630	IVE
1	EA	PULL PLATE	8305-0 4" X 16"	630	IVE
1	EA	SURFACE CLOSER	4111 EDA MC TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	WALL STOP	WS407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE
1			PROX READER AND POWER SUPPLY BY DIVISION 28		
1			REMOTE RELEASE BY DIVISION 26		

CARD IN/ CARD OUT (AREA OF RESTRAINT). USER PRESENTS CREDENTIAL, MAG LOCK RELEASES USER PUSHES OR PULLS DOOR OPEN TO ENTER OR EXIT. DOOR POSITION MAY BE MONITORED THROUGH MAG LOCK IF DESIRED.

REMOTE RELEASE SWITCH LOCATED IN 121 MAY RELEASE MAG LOCKS. COORDINATE LOCATION WITH ARCHITECT.

INTERFACE REQUIRED WITH FIRE-LIFE SAFETY FOR IMMEDIATE RELEASE OF MAG LOCK IN THE EVENT OF FIRE.

HW SET: 13 Payne Building

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	LV9080R 06A EV 29	626	SCH
1	EA	SURFACE CLOSER	4010 MC TBWMS	689	LCN

1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	WALL STOP	WS407CCV	630	IVE
1	SET	SEALS	160S	AL	NGP
1	EA	DOOR BOTTOM	4440SA	CL	NGP

HW SET: 14 Payne Building

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	LV9080R 06A EV 29	626	SCH
1	EA	SURFACE CLOSER	4010 MC TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	WALL STOP	WS407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 15 Payne Building

1	EA	CONTINUOUS HINGE	224HD	628	IVE
1	EA	STOREROOM LOCK	LV9080R 06A EV 29	626	SCH
1	EA	SURFACE CLOSER	4010 MC TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	WALL STOP	WS407CCV	630	IVE
1	SET	SEALS	160S	AL	NGP
1	EA	DOOR SWEEP	96VA	CL	NGP

HW SET: 15.1 Payne Building

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	LV9080R 06A EV 29	626	SCH
1	EA	SURFACE CLOSER	4010 MC TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	WALL STOP	WS407CCV	630	IVE
1	SET	SEALS	160S	AL	NGP

HW SET: 15.2 Payne Building

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PASSAGE SET	L9010 18A	626	SCH
1	EA	SURFACE CLOSER	4010 MC TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	WALL STOP	WS407CCV	630	IVE
1	SET	SEALS	160S	AL	NGP

HW SET: 16 Payne Building

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	LV9080R 06A EV 29	626	SCH

1	EA	SURFACE CLOSER	4010 MC TBWMS	689	LCN
1	EA	WALL STOP	WS407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 17 Payne Building

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	CLASSROOM LOCK	LV9070R 06A EV 29	626	SCH
1	EA	WALL STOP	WS407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 17.1 Payne Building

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	CLASSROOM LOCK	LV9070R 06A EV 29	626	SCH
1	EA	WALL STOP	WS407CCV	630	IVE
1	SET	SEALS	2525B	BRN	NGP
1	EA	DOOR BOTTOM	4440SA	CL	NGP

HW SET: 18 Payne Building

3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	CLASSROOM LOCK	LV9070R 06A EV 29	626	SCH
1	EA	SURFACE CLOSER	4111 CUSH MC	689	LCN
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 19 Payne Building

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	CLASSROOM LOCK	LV9070R 06A EV 29	626	SCH
1	EA	SURFACE CLOSER	4010 H MC TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	WALL STOP	WS407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 20 Payne Building

6	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	MANUAL FLUSH BOLT	FB458 (TOP)	630	IVE
1	EA	CLASSROOM LOCK	LV9070R 06A EV 29	626	SCH
2	EA	FLOOR STOP	FS17	626	IVE
2	EA	SILENCER	SR64	GRY	IVE

HW SET: 21 Payne Building

3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	CLASSROOM LOCK	LV9070R 06A EV 29	626	SCH
1	EA	SURFACE CLOSER	4111 SCUSH MC TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 22 Payne Building

1	EA	CONTINUOUS HINGE	224HD	628	IVE
1	EA	CLASSROOM LOCK	LV9070R 06A EV 29	626	SCH
1	EA	WALL STOP	WS407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 23 Payne Building

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	OFFICE LOCK	LV9050R 06A L583-363 EV 29	626	SCH
1	EA	WALL STOP	WS407CCV	630	IVE
1	SET	SEALS	2525B	BRN	NGP
1	EA	DOOR BOTTOM	4440SA	CL	NGP

HW SET: 23.1 Payne Building

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	OFFICE LOCK	LV9050R 06A L583-363 EV 29	626	SCH
1	EA	WALL STOP	WS407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 24 Payne Building

3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	OFFICE LOCK	LV9050R 06A L583-363 EV 29	626	SCH
1	EA	WALL STOP	WS407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 25 Payne Building

1	SET	PIVOT SET	7255	626	IVE
1	EA	PRIVACY SET	L9044 06A	626	SCH
1	EA	RESCUE STRIKE	455 5-3/4	26D	HAG
1	EA	WALL STOP	WS407CCV	630	IVE
1	SET	SEALS	A626A	CL	NGP

HW SET: 26 Payne Building

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
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1	EA	PRIVACY INDICATOR LK	L9496R 06A L583-363 EV 29	626	SCH
1	EA	WALL STOP	WS407CCV	630	IVE
1	EA	DBL WARDROBE HOOK	582	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 27 Payne Building

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PRIVACY SET	L9044 06A	626	SCH
1	EA	WALL STOP	WS407CCV	630	IVE
1	SET	SEALS	160S	AL	NGP

HW SET: 28 Payne Building

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	INDICATOR RESTROOM	LV9486R 06A L583-375 EV 29	626	SCH
1	EA	SURFACE CLOSER	4010 MC TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	WALL STOP	WS407CCV	630	IVE
1	SET	SEALS	160S	AL	NGP

HW SET: 29 Payne Building

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PASSAGE SET	L9010 06A	626	SCH
1	EA	WALL STOP	WS407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 30 Payne Building

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PUSH PLATE	8200 6" X 16"	630	IVE
1	EA	PULL PLATE	8305-0 4" X 16"	630	IVE
1	EA	AUTO-EQUALIZER	4642 REG FC CS	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	WALL STOP	WS407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE
2	EA	ACTUATOR, WALL MOUNT	8310-853		LCN

HW SET: 31 Payne Building

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
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1	EA	PUSH PLATE	8200 6" X 16"	630	IVE
1	EA	PULL PLATE	8305-0 4" X 16"	630	IVE
1	EA	SURFACE CLOSER	4010 MC TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	WALL STOP	WS407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: AL-01 Payne Building

2	EA	POWER TRANSFER	EPT-10	689	VON
2	EA	CONTINUOUS HINGE	112HD EPT	628	IVE
1	EA	MULLION	KR4954	689	VON
1	EA	PANIC HARDWARE	QEL-RX-98DT 990DT	626	VON
1	EA	PANIC HARDWARE	QEL-RX-LX-98NL 990NL	626	VON
1	EA	MORTISE CYLINDER	20-001 EV 29	626	SCH
1	EA	RIM CYLINDER	80-329 EV 29	626	SCH
1	EA	SURFACE CLOSER	4040XP EDA X 18PA	689	LCN
1	EA	AUTO-EQUALIZER	4642 REG FC CS	689	LCN
2	EA	OVERHEAD STOP	100S-ADJ	630	GLY
1	EA	POWER SUPPLY	PS902-2Q	GRY	VON
2	EA	DOOR POSITION SWITCH	679-05		SCE
1	EA	ACTUATOR, WALL MOUNT	8310-853		LCN
1			PROX READER BY DIVISION 28		
1			THRESHOLD AND PERIMETER SEAL BY DOOR MFG		

EXIT DEVICES ARE ELECTRONICALLY DOGGED FOR PUSH/PULL OPERATION FOR NORMAL OPERATING HOURS. AFTER HOURS ENTRANCE BY CARD READER. USER PRESENTS CREDENTIAL, EXIT DEVICE LATCH RETRACTS, AUTO OPERATOR OPENS DOOR. EXTERIOR ACTUATOR TURNED OFF/ON THROUGH TIME/CALENDAR FEATURE OF SECURITY SYSTEM. DOOR POSITION MONITORED BY SECURITY SYSTEM. ADA OPERATOR FUNCTIONS INDEPENDANT OF INTERIOR OPERATOR. LX SWITCH IN ACTIVE EXIT DEVICE TO BE WIRED IN-SERIES WITH EXTERIOR ACTUATOR TO ENABLE AND DISABLE IT.

HW SET: AL-02 Payne Building

2	EA	CONTINUOUS HINGE	112HD	628	IVE
2	EA	DUMMY TOUCH BAR	350	626	VON
2	EA	DOOR PULL	8105-0 TB	626	IVE
1	EA	SURFACE CLOSER	4040XP EDA X 18PA	689	LCN
1	EA	AUTO-EQUALIZER	4642 REG FC CS	689	LCN
2	EA	OVERHEAD STOP	100S-ADJ	630	GLY
1	EA	ACTUATOR, WALL MOUNT	8310-853		LCN
1	EA	ACTUATOR, WALL MOUNT	8310-855		LCN
1			PERIMETER SEAL BY DOOR MFG		

USER PUSHES ACTUATOR, AUTO OPERATOR OPENS DOOR. OPERATOR FUNCTIONS INDEPENDANT OF EXTERIOR OPERATOR.

HW SET: AL-03 Payne Building

1	EA	POWER TRANSFER	EPT-10	689	VON
1	EA	CONTINUOUS HINGE	112HD EPT	628	IVE
1	EA	PANIC HARDWARE	QEL-RX-98NL 990NL	626	VON
1	EA	RIM CYLINDER	80-329 EV 29	626	SCH
1	EA	SURFACE CLOSER	4040XP EDA X 18PA	689	LCN
1	EA	OVERHEAD STOP	100S-ADJ	630	GLY
1	EA	POWER SUPPLY	PS902-2Q	GRY	VON
1	EA	DOOR POSITION SWITCH	679-05		SCE
1			PROX READER BY DIVISION 28		
1			THRESHOLD AND PERIMETER SEAL BY DOOR MFG		

EXIT DEVICE MAY BE ELECTRONICALLY DOGGED FOR PUSH/PULL OPERATION FOR NORMAL OPERATING HOURS. AFTER HOURS ENTRANCE BY CARD READER. USER PRESENTS CREDENTIAL, EXIT DEVICE LATCH RETRACTS.

HW SET: AL-04 Payne Building

1	EA	CONTINUOUS HINGE	112HD	628	IVE
1	EA	DUMMY TOUCH BAR	350	626	VON
1	EA	DOOR PULL	8105-0 TB	626	IVE
1	EA	SURFACE CLOSER	4040XP EDA X 18PA	689	LCN
1	EA	WALL STOP	WS407CCV	630	IVE
1			PERIMETER SEAL BY DOOR MFG		

HW SET: AL-05 Payne Building

2	EA	POWER TRANSFER	EPT-10	689	VON
2	EA	CONTINUOUS HINGE	112HD EPT	628	IVE
1	EA	PANIC HARDWARE	QEL-RX-9849EO	626	VON
1	EA	PANIC HARDWARE	QEL-RX-9849NL X 990NL	626	VON
1	EA	RIM CYLINDER	80-329 EV 29	626	SCH
1	EA	AUTO. OPERATOR	9553 REG2	628	LCN
1	EA	POWER SUPPLY	PS902-2Q-FA	GRY	VON
2	EA	DOOR POSITION SWITCH	679-05		SCE
1	EA	ACTUATOR, WALL MOUNT	8310-853		LCN
1			REMOTE RELEASE BY DIVISION 26		
1			PROX READER BY DIVISION 28		
1			THRESHOLD AND PERIMETER SEAL BY DOOR MFG		

ENTRANCE BY PROX READER ONLY. BOTH DOORS AUTO OPERATED. DOOR POSITIONS ARE

MONITORED BY SECURITY SYSTEM. OPERATOR TO FUNCTION SEQUENTIALLY WITH INTERIOR OPERATOR. COORDINATE LOCATION OF ACTUATORS, POWER SUPPLIES AND PROX READER WITH ARCHITECT. TIMING OF OPERATORS TO BE DETERMINED BY OWNER.

REMOTE RELEASE SWITCH LOCATED IN ROOM 127 MAY RELEASE MAG LOCKS. COORDINATE LOCATION WITH ARCHITECT.

HW SET: AL-06 Payne Building

2	EA	CONTINUOUS HINGE	112HD	628	IVE
2	EA	DUMMY TOUCH BAR	350	626	VON
2	EA	DOOR PULL	8105-0 TB	626	IVE
1	EA	AUTO. OPERATOR	9553 REG2	628	LCN
2	EA	ACTUATOR, WALL MOUNT	8310-853		LCN
1		PERIMETER SEAL BY DOOR MFG			

ADA OPERATOR TO FUNCTION SIMULATANEOUSLY WITH EXTERIOR OPERATOR. COORDINATE LOCATION OF ACTUATORS WITH ARCHITECT.

HW SET: AL-07 Payne Building

1	EA	POWER TRANSFER	EPT-10	689	VON
1	EA	CONTINUOUS HINGE	112HD EPT	628	IVE
1	EA	PANIC HARDWARE	CX98NL 990NL	626	VON
1	EA	MORTISE CYLINDER	20-001 EV 29	626	SCH
1	EA	RIM CYLINDER	80-329 EV 29	626	SCH
1	EA	ELECTRIC STRIKE	6300 FSE	630	VON
1	EA	SURFACE CLOSER	4040XP EDA X 18PA	689	LCN
1	EA	OVERHEAD STOP	100S-ADJ	630	GLY
1	EA	POWER SUPPLY	PS914	GRY	VON
1	EA	DOOR POSITION SWITCH	679-05		SCE
2		PROX READER BY DIVISION 28			
1		THRESHOLD AND PERIMETER SEAL BY DOOR MFG			

CARD IN/ CARD OUT.

AUTHORIZED ENTRANCE: USER PRESENTS CREDENTIAL, ELECTRIC STRIKE RELEASES, ALARM AND DELAY IS SHUNTED, USER OPENS DOOR TO ENTER.

AUTHORIZED EXIT: USER PRESENTS CREDENTIAL, ALARM AND DELAY IS SHUNTED, USER DEPRESSES EXIT DEVICE BAR TO RETRACT THE LATCH AND EXIT.

UNATHORIZED EXIT: USER DEPRESSES EXIT DEVICE, ALARM SOUNDS AND EXITING IS DELAYED FOR 15 SECONDS.

INTERFACE REQUIRED WITH FIRE-LIFE SAFETY FOR IMMEDIATE RELEASE OF DELAY IN THE EVENT OF A FIRE. DOOR POSITION IS MONITORED BY SECURITY SYSTEM.

**DOOR HARDWARE SCHEDULE ( PEDIATRIC FACILITY )**

HW SET: 01 Pediatric Facility

2	EA	CONTINUOUS HINGE	224HD	628	IVE
1	EA	MULLION	4954	689	VON
2	EA	PANIC HARDWARE	98L-BE 996L-BE 3'	626	VON
2	EA	MAG LOCK	MM15GDT E-MAG	630	SEC
2	EA	SURFACE CLOSER	4111 SCUSH MC TBWMS	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	SET	SEALS	700SA (DO NOT CUT AROUND CLOSER BRACKET)	AL	NGP
2	EA	DOOR SWEEP	C627A	AL	NGP
1	EA	THRESHOLD	425HD	AL	NGP
2	EA	CARD READER	BY DIV 28		B/O
1	EA	POWER SUPPLY	BY DIV 28		B/O
2			DOOR ID LABEL		TBD

CARD IN / CARD OUT. MAG LOCKS NORMALLY SECURED. TO ENTER - USER PRESENTS CREDENTIAL, MAG LOCKS RELEASE, USER DEPRESSES LEVER TO RETRACT EXIT DEVICE LATCH AND ENTER BUILDING. TO EXIT - USER PRESENTS CREDENTIAL, MAG LOCKS RELEASE, USER PUSHES EXIT DEVICE PUSH BAR TO RELEASE LATCH AND EXIT BUILDING. INTERFACE REQUIRED WITH FIRE-LIFE SAFETY SYSTEM REQUIRED FOR RELEASE OF MAG LOCKS IN THE EVENT OF A FIRE. DOOR POSITIONS MAY BE MONITORED THROUGH MAG LOCKS.

HW SET: 02 Pediatric Facility

1	EA	CONTINUOUS HINGE	224HD	628	IVE
1	EA	PANIC HARDWARE	98L-BE 996L-BE 3'	626	VON
1	EA	MAG LOCK	MM15GDT E-MAG	630	SEC
1	EA	CONCEALED CLOSER	2010 BUMPER	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	SET	SEALS	700SA (DO NOT CUT AROUND CLOSER BRACKET)	AL	NGP
1	EA	DOOR SWEEP	C627A	AL	NGP
1	EA	THRESHOLD	425HD	AL	NGP
2	EA	CARD READER	BY DIV 28		B/O
1	EA	POWER SUPPLY	BY DIV 28		B/O
1			DOOR ID LABEL		TBD

CARD IN / CARD OUT. MAG LOCKS NORMALLY SECURED. TO ENTER - USER PRESENTS CREDENTIAL, MAG LOCK RELEASES, USER DEPRESSES LEVER TO RETRACT EXIT DEVICE LATCH AND ENTER BUILDING. TO EXIT - USER PRESENTS CREDENTIAL, MAG LOCKS RELEASE, USER PUSHES EXIT DEVICE PUSH BAR TO RELEASE LATCH AND EXIT BUILDING. INTERFACE REQUIRED WITH FIRE-LIFE SAFETY SYSTEM REQUIRED FOR RELEASE OF MAG LOCKS IN THE EVENT OF A FIRE. DOOR POSITIONS MAY BE MONITORED THROUGH MAG LOCKS.

HW SET: 03 Pediatric Facility

1	EA	CONTINUOUS HINGE	224HD	628	IVE
1	EA	PANIC HARDWARE	98L-BE 996L-BE 3'	626	VON
1	EA	MORTISE CYLINDER	20-001 EV 29	626	SCH
1	EA	MAG LOCK	MM15GDT E-MAG	630	SEC
1	EA	CONCEALED CLOSER	2010 BUMPER	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	SET	SEALS	700SA (DO NOT CUT AROUND CLOSER BRACKET)	AL	NGP
1	EA	DOOR SWEEP	C627A	AL	NGP
1	EA	THRESHOLD	425HD	AL	NGP
1	EA	KEYSWITCH	653-04	630	SCE
2	EA	CARD READER	BY DIV 28		B/O
1	EA	POWER SUPPLY	BY DIV 28		B/O
1			DOOR ID LABEL		TBD

CARD IN / CARD OUT. MAG LOCKS NORMALLY SECURED. TO ENTER - USER PRESENTS CREDENTIAL, MAG LOCK RELEASES, USER DEPRESSES LEVER TO RETRACT EXIT DEVICE LATCH AND ENTER BUILDING. TO EXIT - USER PRESENTS CREDENTIAL, MAG LOCKS RELEASE, USER PUSHES EXIT DEVICE PUSH BAR TO RELEASE LATCH AND EXIT BUILDING. INTERFACE REQUIRED WITH FIRE-LIFE SAFETY SYSTEM REQUIRED FOR RELEASE OF MAG LOCKS IN THE EVENT OF A FIRE. DOOR POSITIONS MAY BE MONITORED THROUGH MAG LOCKS. KEYSWITCH IS USED FOR MOMENTARY RELEASE OF MAG LOCKS BY KEY/STAFF.

HW SET: 04 Pediatric Facility

1	EA	CONTINUOUS HINGE	700 HT	630	IVE
1	EA	PANIC HARDWARE	98L-BE 996L-BE 3'	626	VON
2	EA	MORTISE CYLINDER	20-001 EV 29	626	SCH
1	EA	MAG LOCK	MM15GDT E-MAG	630	SEC
1	EA	CONCEALED CLOSER	2010 BUMPER	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW X TORK SCREWS	630	IVE
1	SET	SEALS	700SA (DO NOT CUT AROUND CLOSER BRACKET)	AL	NGP
1	EA	DOOR SWEEP	C627A	AL	NGP
1	EA	THRESHOLD	425HD	AL	NGP
2	EA	KEYSWITCH	653-04	630	SCE
1	EA	POWER SUPPLY	BY DIV 28		B/O
1			DOOR ID LABEL		TBD

MAG LOCKS ALWAYS SECURED. DOOR POSITION MAY BE MONITORED BY ACCESS CONTROL SYSTEM THROUGH MAG LOCK. INTERFACE REQUIRED WITH FIRE LIFE SAFETY SYSTEM TO RELEASE MAG LOCKS IN THE EVENT OF A FIRE. KEYSWITCH TO MOMENTARILY RELEASE MAGNETS BY KEY/STAFF INTERIOR AND EXTERIOR.

HW SET: 05 Pediatric Facility

2	EA	CONTINUOUS HINGE	700 HT	630	IVE
1	EA	MULLION	4954	689	VON
2	EA	PANIC HARDWARE	98L-BE 996L-BE 3'	626	VON
1	EA	MORTISE CYLINDER	20-001 EV 29	626	SCH
2	EA	MAG LOCK	MM15GDT E-MAG	630	SEC
2	EA	CONCEALED CLOSER	2010 BUMPER	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW X TORK SCREWS	630	IVE
1	SET	SEALS	700SA (DO NOT CUT AROUND CLOSER BRACKET)	AL	NGP
2	EA	DOOR SWEEP	C627A	AL	NGP
1	EA	THRESHOLD	425HD	AL	NGP
1	EA	KEYSWITCH	653-04	630	SCE
1	EA	POWER SUPPLY	BY DIV 28		B/O
2			DOOR ID LABEL		TBD

MAG LOCKS ALWAYS SECURED. DOOR POSITION MAY BE MONITORED BY ACCESS CONTROL SYSTEM THROUGH MAG LOCK. INTERFACE REQUIRED WITH FIRE LIFE SAFETY SYSTEM TO RELEASE MAG LOCKS IN THE EVENT OF A FIRE. KEYSWITCH USED ON THE INTERIOR TO MOMENTARILY RELEASE MAG LOCKS.

HW SET: 06 Pediatric Facility

3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	STOREROOM LOCK	LV9080R 06A EV 29	630	SCH
1	EA	SURFACE CLOSER	4111 SCUSH MC TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	SET	SEALS	700SA (DO NOT CUT AROUND CLOSER BRACKET)	AL	NGP
1	EA	DOOR SWEEP	C627A	AL	NGP
1	EA	THRESHOLD	425HD	AL	NGP
1	EA	DOOR POSITION SWITCH	679-05		SCE
1			DOOR ID LABEL		TBD

INSTALL WEATHERSTRIP FIRST. DO NOT CUT AROUND CLOSER BRACKET. DOOR POSITION IS MONITORED BY ACCESS CONTROL SYSTEM.

HW SET: 06.1 Pediatric Facility

3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	STOREROOM LOCK	LV9080R 06A EV 29	630	SCH
1	EA	SURFACE CLOSER	4111 SCUSH MC TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	SET	SEALS	700SA (DO NOT CUT AROUND CLOSER BRACKET)	AL	NGP
1	EA	DOOR SWEEP	C627A	AL	NGP
1	EA	THRESHOLD	425HD	AL	NGP
1	EA	DOOR POSITION SWITCH	679-05		SCE
1			DOOR ID LABEL		TBD

INSTALL WEATHERSTRIP FIRST. DO NOT CUT AROUND CLOSER BRACKET. DOOR POSITION IS MONITORED BY ACCESS CONTROL SYSTEM.

HW SET: 07 Pediatric Facility

3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	STOREROOM LOCK	LV9080R 06A EV 29	630	SCH
1	EA	SURFACE CLOSER	4111 SCUSH MC TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	SET	SEALS	700SA (DO NOT CUT AROUND CLOSER BRACKET)	AL	NGP
1	EA	DOOR SWEEP	C627A	AL	NGP
1	EA	THRESHOLD	425HD	AL	NGP
1			DOOR ID LABEL		TBD

HW SET: 08 Pediatric Facility

3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	FIRE EXIT HARDWARE	XP98L-F 996L 3'	626	VON
1	EA	RIM CYLINDER	80-329 EV 29	626	SCH
1	EA	SURFACE CLOSER	4111 SCUSH MC TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	SET	SEALS	700SA (DO NOT CUT AROUND CLOSER BRACKET)	AL	NGP
1	EA	DOOR SWEEP	C627A	AL	NGP
1	EA	THRESHOLD	425HD	AL	NGP
1	EA	DOOR POSITION SWITCH	679-05		SCE
1			DOOR ID LABEL		TBD

INSTALL WEATHERSTRIP FIRST. DO NOT CUT AROUND CLOSER BRACKET. DOOR POSITION IS MONITORED BY ACCESS CONTROL SYSTEM.

HW SET: 08.1 Pediatric Facility

3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	PANIC HARDWARE	XP98L 996L	626	VON
1	EA	RIM CYLINDER	80-329 EV 29	626	SCH
1	EA	SURFACE CLOSER	4111 SCUSH MC TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	SET	SEALS	700SA (DO NOT CUT AROUND CLOSER BRACKET)	AL	NGP
1	EA	DOOR SWEEP	C627A	AL	NGP
1	EA	THRESHOLD	425HD	AL	NGP
1	EA	DOOR POSITION SWITCH	679-05		SCE
1			DOOR ID LABEL		TBD

INSTALL WEATHERSTRIP FIRST. DO NOT CUT AROUND CLOSER BRACKET. DOOR POSITION IS MONITORED BY ACCESS CONTROL SYSTEM.

HW SET: 09 Pediatric Facility

1	EA	CONTINUOUS HINGE	224HD	628	IVE
1	EA	PANIC HARDWARE	98L-NL 996L	626	VON
1	EA	RIM CYLINDER	80-329 EV 29	626	SCH
1	EA	SURFACE CLOSER	4111 SCUSH MC TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	SET	SEALS	700SA (DO NOT CUT AROUND CLOSER BRACKET)	AL	NGP
1	EA	DOOR SWEEP	C627A	AL	NGP
1	EA	THRESHOLD	425HD	AL	NGP
1			DOOR ID LABEL		TBD

HW SET: 10 Pediatric Facility

1	EA	CONTINUOUS HINGE	700 HT	630	IVE
1	EA	MAG LOCK	MM15GDT E-MAG	630	SEC
1	EA	DUMMY TOUCH BAR	350	626	VON
1	EA	PULL PLATE	8305-0 4" X 16" X TORK SCREWS	630	IVE
1	EA	CONCEALED CLOSER	2010 BUMPER	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW X TORK SCREWS	630	IVE
1	EA	WALL STOP	WS407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE
2	EA	CARD READER	BY DIV 28		B/O
1	EA	POWER SUPPLY	BY DIV 28		B/O
1			DOOR ID LABEL		TBD

CARD IN/ CARD OUT. MAG LOCKS NORMALLY SECURED. USER PRESENTS CREDENTIAL, MAG LOCK RELEASES, USER PUSHES OR PULLS DOOR OPEN TO ENTER. DOOR POSITION MAY BE MONITORED BY ACCESS CONTROL SYSTEM THROUGH MAG LOCK. INTERFACE REQUIRED WITH FIRE LIFE SAFETY SYSTEM TO RELEASE MAG LOCKS IN THE EVENT OF A FIRE.

HW SET: 11 Pediatric Facility

2	EA	CONTINUOUS HINGE	700 HT	630	IVE
2	EA	MAG LOCK	MM15GDT E-MAG	630	SEC
2	EA	DUMMY TOUCH BAR	350	626	VON
2	EA	CONCEALED CLOSER	2010 BUMPER	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW X TORK SCREWS	630	IVE
2	EA	WALL STOP	WS407CCV	630	IVE
2	EA	SILENCER	SR64	GRY	IVE
2	EA	CARD READER	BY DIV 28		B/O
1	EA	POWER SUPPLY	BY DIV 28		B/O
2			DOOR ID LABEL		TBD

CARD IN /CARD OUT. MAG LOCKS NORMALLY SECURED. USER PRESENTS CREDENTIAL, MAG LOCKS RELEASE, USER PUSHES OPEN DOOR TO ENTER. DOOR POSITION MAY BE MONITORED BY ACCESS CONTROL SYSTEM THROUGH MAG LOCK. INTERFACE REQUIRED WITH FIRE LIFE SAFETY SYSTEM TO RELEASE MAG LOCKS IN THE EVENT OF A FIRE.

HW SET: 12 Pediatric Facility

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	LV9080R 06A EV 29	630	SCH
1	EA	ELECTRIC STRIKE	6212 FSE 24VDC	630	VON
1	EA	SURFACE CLOSER	4010 MC TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	WALL STOP	WS407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE
1	EA	CARD READER	BY DIV 28		B/O
1	EA	POWER SUPPLY	BY DIV 28		B/O
1			DOOR ID LABEL		TBD

CARD IN. USER PRESENTS CREDENTIAL, ELECTRIC STRIKE KEEPER RELEASES, USER OPENS DOOR TO ENTER. NO DPS, NO REX.

HW SET: 13 Pediatric Facility

2	EA	CONTINUOUS HINGE	224HD	628	IVE
2	EA	MAG LOCK	MM15GDT E-MAG	630	SEC
2	EA	PUSH PLATE	8200 6" X 16"	630	IVE
2	EA	PULL PLATE	8305-0 4" X 16"	630	IVE
2	EA	SURFACE CLOSER	4010 MC TBWMS	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
2	EA	WALL STOP	WS407CCV	630	IVE
2	EA	SILENCER	SR64	GRY	IVE
2	EA	CARD READER	BY DIV 28		B/O
1	EA	POWER SUPPLY	BY DIV 28		B/O
2			DOOR ID LABEL		TBD

CARD IN. MAG LOCKS NORMALLY SECURED. USER PRESENTS CREDENTIAL, MAG LOCKS RELEASE,

USER PUSHES OR PULLS DOOR OPEN TO ENTER. DOOR POSITION MAY BE MONITORED BY ACCESS CONTROL SYSTEM THROUGH MAG LOCK. INTERFACE REQUIRED WITH FIRE LIFE SAFETY SYSTEM TO RELEASE MAG LOCKS IN THE EVENT OF A FIRE.

HW SET: 14 Pediatric Facility

2	EA	CONTINUOUS HINGE	700 HT	630	IVE
2	EA	FIRE EXIT HARDWARE	9849EO-F-LBL 4'	626	VON
2	EA	MAG LOCK	MM15GDT E-MAG	630	SEC
2	EA	CONCEALED CLOSER	2010 BUMPER	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW X TORK SCREWS	630	IVE
2	EA	WALL STOP	WS407CCV	630	IVE
1	SET	SEALS	160S	AL	NGP
2	EA	CARD READER	BY DIV 28		B/O
1	EA	POWER SUPPLY	BY DIV 28		B/O
2			DOOR ID LABEL		TBD

CARD IN. MAG LOCKS NORMALLY SECURED. USER PRESENTS CREDENTIAL, MAG LOCKS RELEASE, USER PUSHES EXIT DEVICE PUSH BAR TO OPEN DOOR AND ENTER. DOOR POSITION MAY BE MONITORED BY ACCESS CONTROL SYSTEM THROUGH MAG LOCK. INTERFACE REQUIRED WITH FIRE LIFE SAFETY SYSTEM TO RELEASE MAG LOCKS IN THE EVENT OF A FIRE.

HW SET: 15 Pediatric Facility

2	EA	CONTINUOUS HINGE	700 HT	630	IVE
2	EA	FIRE EXIT HARDWARE	9849EO-F-LBL 4'	626	VON
1	EA	MORTISE CYLINDER	20-001 EV 29	626	SCH
2	EA	CONCEALED CLOSER	2010 BUMPER	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW X TORK SCREWS	630	IVE
2	EA	400 LB MAG HO	2510 (LESS RELEASE BUTTON)	630	ABH
1	SET	SEALS	160S X TORK SCREWS	AL	NGP
1	EA	KEYSWITCH	653-04	630	SCE
2			DOOR ID LABEL		TBD

DOORS NORMALLY HELD OPEN. KEYSWITCH TO RELEASE MAGNETS. INTERFACE REQUIRED WITH FIRE LIFE SAFETY SYSTEM TO RELEASE MAG LOCKS IN THE EVENT OF A FIRE.

HW SET: 16 Pediatric Facility

1	EA	CONTINUOUS HINGE	224HD	628	IVE
1	EA	STOREROOM LOCK	LV9080R 06A EV 29	630	SCH
1	EA	SURFACE CLOSER	4010 MC TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	WALL STOP	WS407CCV	630	IVE
1	SET	SEALS	160S	AL	NGP
1			DOOR ID LABEL		TBD

HW SET: 17 Pediatric Facility

6	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	AUTO FLUSH BOLT	FB31T	630	IVE
1	EA	STOREROOM LOCK	LV9080R 06A EV 29	630	SCH
1	EA	COORDINATOR	COR X FL X BRACKETS AS REQ'D	628	IVE
1	EA	ASTRAGAL	139A	600	NGP
2	EA	SURFACE CLOSER	4111 EDA MC TBWMS	689	LCN
2	EA	WALL STOP	WS407CCV	630	IVE
1	SET	SEALS	160S	AL	NGP
2			DOOR ID LABEL		TBD

HW SET: 18 Pediatric Facility

1	EA	CONTINUOUS HINGE	700 HT	630	IVE
1	EA	ANTI LIG STORERM LK	LV9080R SL1-A XL12-482 EV 29	630	SCH
1	EA	SURFACE CLOSER	4111 EDA MC TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW X TORK SCREWS	630	IVE
1	EA	WALL STOP	WS407CCV	630	IVE
1	SET	SEALS	160S X TORK SCREWS	AL	NGP
1			DOOR ID LABEL		TBD

HW SET: 19 Pediatric Facility

1	EA	CONTINUOUS HINGE	700 HT	630	IVE
1	EA	ANTI LIG CLASSRM LK	LV9070R SL1-A XL12-482 EV 29	630	SCH
1	EA	SURFACE CLOSER	4111 EDA MC TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW X TORK SCREWS	630	IVE
1	EA	WALL STOP	WS407CCV	630	IVE
1	SET	SEALS	160S X TORK SCREWS	AL	NGP
1			DOOR ID LABEL		TBD

HW SET: 20 Pediatric Facility

1	EA	BY DOOR MFG	LITE KIT		B/O
1	EA	CONTINUOUS HINGE	700 HT	630	IVE
1	EA	ANTI LIG ASYLUM LK	L9082R SL1-A XL12-482 EV 29	626	SCH
1	EA	CONCEALED CLOSER	2010 BUMPER	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW X TORK SCREWS	630	IVE
1	EA	WALL STOP	WS407CCV	630	IVE
1	SET	SEALS	160S X TORK SCREWS	AL	NGP
1			DOOR ID LABEL		TBD

HW SET: 21 Pediatric Facility

1	EA	SECURITY LITE KIT	L-VGLF-PZ 9"X 9"		NGP
1	EA	CONTINUOUS HINGE	700 HT	630	IVE
1	EA	ANTI LIG CLASSRM LK	LV9070R SL1-A XL12-482 EV 29	630	SCH
1	EA	CONCEALED CLOSER	2010 BUMPER	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW X TORK SCREWS	630	IVE
1			DOOR ID LABEL		TBD

HW SET: 22 Pediatric Facility

1	EA	SECURITY LITE KIT	L-VGLF-PZ 9"X 9"		NGP
1	EA	CONTINUOUS HINGE	700 HT	630	IVE
1	EA	MORTISE CYLINDER	20-001 EV 29	626	SCH
1	EA	SHEAR LOCKS	LV1122 XB XTS	630	DOR
1	EA	DOOR PULL	8112-5 X TORK FASTENERS	626	IVE
1	EA	POWER SUPPLY	PS902		SCE
1	EA	KEYSWITCH	653-14-L2 HDP	630	SCE
1			DOOR ID LABEL		TBD

KEYSWITCH TO CONTROL SHEAR LOCKS. LED LIGHTS TO INDICATE WHEN SHEAR LOCKS ARE ENGAGED. INTERIOR SIDE OF DOOR TO BE BLANK.

HW SET: 23 Pediatric Facility

3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	CLASSROOM LOCK	LV9070R 06A EV 29	630	SCH
1	EA	SURFACE CLOSER	4111 HEDA MC TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	WALL STOP	WS407CCV	630	IVE
1	SET	SEALS	160S	AL	NGP
1	EA	DOOR SWEEP	96VA	CL	NGP
1			DOOR ID LABEL		TBD

HW SET: 23.1 Pediatric Facility

3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	CLASSROOM LOCK	LV9070R 06A EV 29	630	SCH
1	EA	SURFACE CLOSER	4111 EDA MC TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	WALL STOP	WS407CCV	630	IVE
1	SET	SEALS	160S	AL	NGP
1	EA	DOOR SWEEP	96VA	CL	NGP
1			DOOR ID LABEL		TBD

HW SET: 24 Pediatric Facility

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	CLASSROOM LOCK	LV9070R 06A EV 29	630	SCH
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	WALL STOP	WS407CCV	630	IVE
1	SET	SEALS	160S	AL	NGP
1	EA	DOOR SWEEP	96VA	CL	NGP
1			DOOR ID LABEL		TBD

HW SET: 25 Pediatric Facility

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	CLASSROOM LOCK	LV9070R 06A EV 29	630	SCH
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	WALL STOP	WS407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE
1			DOOR ID LABEL		TBD

HW SET: 26 Pediatric Facility

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	CLASSROOM LOCK	LV9070R 06A EV 29	630	SCH
1	EA	SURFACE CLOSER	4111 EDA MC TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	WALL STOP	WS407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE
1			DOOR ID LABEL		TBD

HW SET: 27 Pediatric Facility

3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	STOREROOM LOCK	LV9080R 06A EV 29	630	SCH
1	EA	SURFACE CLOSER	4111 HEDA MC TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	WALL STOP	WS407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE
1			DOOR ID LABEL		TBD

HW SET: 27.1 Pediatric Facility

3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	STOREROOM LOCK	LV9080R 06A EV 29	630	SCH
1	EA	SURFACE CLOSER	4010 MC TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	WALL STOP	WS407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE
1			DOOR ID LABEL		TBD

HW SET: 28 Pediatric Facility

1	EA	CONTINUOUS HINGE	700 HT	630	IVE
1	EA	ANTI LIG CLASSRM LK	LV9070R SL1-A XL12-482 EV 29	630	SCH
1	EA	KICK PLATE	8400 10" X 2" LDW X TORK SCREWS	630	IVE
1	EA	WALL STOP	WS407CCV	630	IVE
1	SET	SEALS	160S X TORK SCREWS	AL	NGP
1	EA	DOOR SWEEP	96VA X TORK SCREWS	CL	NGP
1			DOOR ID LABEL		TBD

HW SET: 29 Pediatric Facility

1	EA	CONTINUOUS HINGE	700 HT	630	IVE
1	EA	ANTI LIG CLASSRM LK	LV9070R SL1-A XL12-482 EV 29	630	SCH
1	EA	KICK PLATE	8400 10" X 2" LDW X TORK SCREWS	630	IVE
1	EA	WALL STOP	WS407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE
1			DOOR ID LABEL		TBD

HW SET: 30 Pediatric Facility

1	EA	CONTINUOUS HINGE	700 HT	630	IVE
1	EA	ANTI LIG CLASSRM LK	LV9070R SL1-A XL12-482 EV 29	630	SCH
1	EA	CONCEALED CLOSER	2010 H BUMPER	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW X TORK SCREWS	630	IVE
1	EA	WALL STOP	WS407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE
1			DOOR ID LABEL		TBD

HW SET: 31 Pediatric Facility

1	EA	CONTINUOUS HINGE	700 HT	630	IVE
1	EA	ANTI LIG STORERM LK	LV9080R SL1-A XL12-482 EV 29	630	SCH
1	EA	SURFACE CLOSER	4111 EDA MC TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW X TORK SCREWS	630	IVE
1	EA	WALL STOP	WS407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE
1			DOOR ID LABEL		TBD

HW SET: 32 Pediatric Facility

1	EA	BY DOOR MFG	LITE KIT		B/O
1	EA	CONTINUOUS HINGE	700 HT	630	IVE
1	EA	ANTI LIG CLASSRM LK	LV9070R SL1-A-SK1-A-XL12-482-XL11-000 EV 29	630	SCH
1	EA	CONCEALED CLOSER	2010 BUMPER	689	LCN
3	EA	SILENCER	SR64	GRY	IVE
1	EA	DOOR POSITION	679-05		SCE
			SWITCH		
1			DOOR ID LABEL		TBD

DOOR POSITION INDICATOR TO BE WIRED BACK TO A PANEL LOCATED IN THE NURSE'S STATION TO ALLOW STAFF TO MONITOR DOORS.

HW SET: 32.1 Pediatric Facility

1	EA	BY DOOR MFG	LITE KIT		B/O
1	EA	CONTINUOUS HINGE	700 HT	630	IVE
1	EA	ANTI LIG CLASSRM LK	LV9070R SL1-A XL12-482 EV 29	630	SCH
1	EA	CONCEALED CLOSER	2010 BUMPER	689	LCN
3	EA	SILENCER	SR64	GRY	IVE
1	EA	DOOR POSITION	679-05		SCE
			SWITCH		
1			DOOR ID LABEL		TBD

DOOR POSITION INDICATOR TO BE WIRED BACK TO A PANEL LOCATED IN THE NURSE'S STATION TO ALLOW STAFF TO MONITOR DOORS.

HW SET: 33 Pediatric Facility

1	EA	CONTINUOUS HINGE	700 HT	630	IVE
1	EA	ANTI LIG STORERM LK	LV9080R SL1-A-SK1-A-XL12-482-XL11-000 EV 29	630	SCH
1	EA	CONCEALED CLOSER	2010 BUMPER	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW X TORK SCREWS	630	IVE
3	EA	SILENCER	SR64	GRY	IVE
1			DOOR ID LABEL		TBD

HW SET: 33.1 Pediatric Facility

1	EA	CONTINUOUS HINGE	700 HT TORK FASTENERS X CUSTOM HEIGHT	630	IVE
1	EA	ROLLER LATCH	RL30-A (LOCK EDGE MOUNT)	626	IVE
1	SET	FLUSH PULL	1060 (B-T-B W TORK FASTENERS)	626	TRI
2	EA	DOOR EDGE GUARD	302 (TOP & BOTTOM, CUSTOM)	630	ROC
1	EA	WALL STOP	WS407CCV (WHERE REQ'D)	630	IVE

HW SET: 33.2 Pediatric Facility

1	EA	CONTINUOUS HINGE	700 HT	630	IVE
1	EA	ANTI LIG STORERM LK	LV9080R SL1-A XL12-482 EV 29	630	SCH
1	EA	CONCEALED CLOSER	2010 BUMPER	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW X TORK SCREWS	630	IVE
3	EA	SILENCER	SR64	GRY	IVE
1			DOOR ID LABEL		TBD

HW SET: 34 Pediatric Facility

1	EA	CONTINUOUS HINGE	700 HT	630	IVE
1	EA	ANTI LIG STORERM LK	LV9080R SL1-A XL12-482 EV 29	630	SCH
1	EA	KICK PLATE	8400 10" X 2" LDW X TORK SCREWS	630	IVE
1	EA	WALL STOP	WS407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE
1			DOOR ID LABEL		TBD

HW SET: 35 Pediatric Facility

1	EA	CONTINUOUS HINGE	700 HT	630	IVE
1	EA	ANTI LIG PASSAGE	L9010 SK1-A XL11-000 (KNOB)	626	SCH
1	EA	CONCEALED CLOSER	2010 H BUMPER	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW X TORK SCREWS	630	IVE
1	EA	WALL STOP	WS407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE
1			DOOR ID LABEL		TBD

HW SET: 36 Pediatric Facility

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PUSH PLATE	8200 6" X 16" X TORK SCREWS	630	IVE
1	EA	PULL PLATE	8305-0 4" X 16" X TORK SCREWS	630	IVE
1	EA	CONCEALED CLOSER	2010 BUMPER	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW X TORK SCREWS	630	IVE
1	EA	WALL STOP	WS407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE
1			DOOR ID LABEL		TBD

HW SET: 37 Pediatric Facility

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PASSAGE SET	L9010 06A	626	SCH
1	EA	WALL STOP	WS407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE
1			DOOR ID LABEL		TBD

HW SET: 38 Pediatric Facility

1	EA	CONTINUOUS HINGE	700 HT	630	IVE
1	EA	ANTI-LIG DEADBOLT	L464R SK1 XL11-000	630	SCH
1	EA	WALL STOP	WS407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE
1			DOOR ID LABEL		TBD

HW SET: 39 Pediatric Facility

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	HOSP PRIVACY SET	L9044 06A	626	SCH
1	EA	SURFACE CLOSER	4111 EDA MC TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	WALL STOP	WS407CCV	630	IVE
1	SET	SEALS	160S	AL	NGP
1			DOOR ID LABEL		TBD

HW SET: 40 Pediatric Facility

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PRIVACY INDICATOR	L9496R 06A L583-363 EV 29	630	SCH
		LK			
1	EA	SURFACE CLOSER	4111 EDA MC TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	WALL STOP	WS407CCV	630	IVE
1	SET	SEALS	160S	AL	NGP
1			DOOR ID LABEL		TBD

HW SET: 41 Pediatric Facility

2	EA	CONTINUOUS HINGE	224HD	628	IVE
1	EA	MULLION	4954	689	VON
2	EA	PANIC HARDWARE	CD98L 996L	626	VON
2	EA	MORTISE CYLINDER	20-001 EV 29	626	SCH
2	EA	RIM CYLINDER	80-329 EV 29	626	SCH
2	EA	SURFACE CLOSER	4111 HEDA MC TBWMS	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
2	EA	WALL STOP	WS407CCV	630	IVE
2	EA	SILENCER	SR64	GRY	IVE
2			DOOR ID LABEL		TBD

HW SET: 42 Pediatric Facility

2	EA	CONTINUOUS HINGE	224HD	628	IVE
1	EA	MULLION	KR4954	689	VON
2	EA	PANIC HARDWARE	CD98L 996L	626	VON
3	EA	MORTISE CYLINDER	20-001 EV 29	626	SCH
2	EA	RIM CYLINDER	80-329 EV 29	626	SCH
2	EA	SURFACE CLOSER	4111 HEDA MC TBWMS	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
2	EA	WALL STOP	WS407CCV	630	IVE
2	EA	SILENCER	SR64	GRY	IVE
2			DOOR ID LABEL		TBD

HW SET: 43 Pediatric Facility

1	EA	CONTINUOUS HINGE	224HD	628	IVE
1	EA	PANIC HARDWARE	98L-NL 996L	626	VON
1	EA	RIM CYLINDER	80-329 EV 29	626	SCH
1	EA	SURFACE CLOSER	4111 EDA MC TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	WALL STOP	WS407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE
1			DOOR ID LABEL		TBD

HW SET: AL-01 Pediatric Facility

2	EA	POWER TRANSFER	EPT-10	689	VON
2	EA	CONTINUOUS HINGE	112HD EPT	628	IVE
1	EA	MULLION	KR4954	689	VON
1	EA	PANIC HARDWARE	QEL-RX-98DT 990DT	626	VON
1	EA	PANIC HARDWARE	QEL-RX-LX-98NL 990NL	626	VON
1	EA	MORTISE CYLINDER	20-001 EV 29	626	SCH
1	EA	RIM CYLINDER	80-329 EV 29	626	SCH
2	EA	OFFSET POST PULL	9264F - 36"	630	IVE
1	EA	SURFACE CLOSER	4040XP EDA X 18PA	689	LCN
1	EA	AUTO-EQUALIZER	4642 REG FC CS	689	LCN
2	EA	OVERHEAD STOP	100S-ADJ	630	GLY
1	EA	POWER SUPPLY	PS902-2Q	GRY	VON
1	EA	WIRING DIAGRAM	POINT TO POINT		LCN
2	EA	DOOR POSITION SWITCH	679-05		SCE
2	EA	ACTUATOR, WALL MOUNT	8310-853		LCN
1	EA	CARD READER	BY DIV 28		B/O
1	EA	POWER SUPPLY	BY DIV 28		B/O
2			DOOR ID LABEL		TBD
1			THRESHOLD AND PERIMETER SEAL BY DOOR MFG		

EXIT DEVICES ARE ELECTRONICALLY DOGGED FOR PUSH/PULL OPERATION FOR NORMAL OPERATING HOURS. AFTER HOURS ENTRANCE BY CARD READER. USER PRESENTS CREDENTIAL, EXIT DEVICE LATCH RETRACTS, AUTO OPERATOR OPENS DOOR. EXTERIOR ACTUATOR TURNED OFF/ON THROUGH TIME/CALENDAR FEATURE OF SECURITY SYSTEM. DOOR POSITION MONITORED BY SECURITY SYSTEM. LX SWITCH IN ACTIVE EXIT DEVICE TO BE WIRED IN-SERIES WITH EXTERIOR ACTUATOR TO ENABLE AND DISABLE IT.

ADA OPERATOR FUNCTIONS INDEPENDENT OF INTERIOR OPERATOR.

EXITING ALWAYS ALLOWED BY PUSHING EXIT DEVICE OR INTERIOR VESTIBULE ACTUATOR.

HW SET: AL-02 Pediatric Facility

2	EA	CONTINUOUS HINGE	112HD	628	IVE
2	EA	MAG LOCK	MM15GDT E-MAG	630	SEC
2	EA	DUMMY TOUCH BAR	350	626	VON
2	EA	OFFSET POST PULL	9264F - 36"	630	IVE
1	EA	SURFACE CLOSER	4040XP EDA X 18PA	689	LCN
1	EA	AUTO-EQUALIZER	4642 REG FC CS	689	LCN
2	EA	OVERHEAD STOP	100S-ADJ	630	GLY
1	EA	WIRING DIAGRAM	POINT TO POINT		LCN
1	EA	ACTUATOR, WALL MOUNT	8310-853		LCN
1	EA	ACTUATOR, WALL MOUNT	8310-855		LCN
2	EA	CARD READER	BY DIV 28		B/O
1	EA	POWER SUPPLY	BY DIV 28		B/O
2			DOOR ID LABEL		TBD
1			RELAYS AS REQUIRED BY DIVISION 26		B/O
1			REMOTE RELEASE SWITCH BY DIVISION 26		B/O
1			THRESHOLD AND PERIMETER SEAL BY DOOR MFG		

CARD IN/ CARD OUT, AND REMOTE RELEASE.

ENTRANCE: USER PRESENTS CREDENTIAL, MAG LOCKS RELEASE AND AUTO OPERATOR VESTIBULE ACTUATOR TURNS ON. USER CAN PULL DOOR OPEN OR PUSH ACTUATOR TO HAVE ADA OPERATOR OPEN DOOR TO ENTER.

EXIT: USER PRESENTS CREDENTIAL MAG LOCKS RELEASE AND AUTO OPERATOR INTERIOR ACTUATOR TURNS ON. USER EITHER PUSHES DOOR OPEN OR PUSHES ACTUATOR TO HAVE ADA OPERATOR OPEN DOOR TO ENTER.

REMOTE RELEASE: REMOTE SWITCH IS TOGGLED, MAG LOCKS RELEASE AND AUTO OPERATOR INTERIOR AND INTERIOR VESTIBULE ACTUATOR TURNS ON. USER EITHER PUSHES OR PULLS DOOR OPEN OR PUSHES EITHER ACTUATOR TO HAVE ADA OPERATOR OPEN DOOR TO ENTER OR EXIT.

ADA OPERATOR OPERATES INDEPENDENTLY FROM EXTERIOR OPERATOR.

HW SET: AL-03 Pediatric Facility

2	EA	CONTINUOUS HINGE	112HD	628	IVE
1	EA	MULLION	4854-B	689	VON
1	EA	PANIC HARDWARE	98EO	626	VON
1	EA	PANIC HARDWARE	98NL-OP 3'	626	VON
1	EA	ELECTRIC STRIKE	6300 FSE	630	VON
2	EA	OFFSET POST PULL	9264F - 36"	630	IVE
1	EA	SURFACE CLOSER	4040XP EDA X 18PA	689	LCN
1	EA	AUTO-EQUALIZER	4642 REG FC CS	689	LCN
2	EA	OVERHEAD STOP	100S-ADJ	630	GLY
2	EA	DOOR POSITION SWITCH	679-05		SCE
1	EA	ACTUATOR, WALL MOUNT	8310-853 (INTERIOR ACTUATOR)		LCN
1	EA	CARD READER	BY DIV 28		B/O
1	EA	POWER SUPPLY	BY DIV 28		B/O
2			DOOR ID LABEL		TBD
1			THRESHOLD AND PERIMETER SEAL BY DOOR MFG		

CARD IN. USER PRESENTS CREDENTIAL, ELECTRIC STRIKE KEEPER RELEASES, ADA OPERATOR OPENS THE DOOR FOR ENTRANCE. DOOR POSITION IS MONITORED BY ACCESS CONTROL SYSTEM. CARD READER IS EXTERIOR ACTUATOR.

HW SET: AL-04 Pediatric Facility

1	EA	CONTINUOUS HINGE	112HD	628	IVE
1	EA	PANIC HARDWARE	98L-BE 996L-BE 3'	626	VON
1	EA	MAG LOCK	MM15GDT E-MAG	630	SEC
1	EA	SURFACE CLOSER	4040XP EDA X 18PA	689	LCN
1	EA	OVERHEAD STOP	100S-ADJ	630	GLY
2	EA	CARD READER	BY DIV 28		B/O
1	EA	POWER SUPPLY	BY DIV 28		B/O
1			DOOR ID LABEL		TBD
1			THRESHOLD AND PERIMETER SEAL BY DOOR MFG		

CARD IN / CARD OUT. MAG LOCKS NORMALLY SECURED. TO ENTER - USER PRESENTS CREDENTIAL, MAG LOCK RELEASES, USER DEPRESSES LEVER TO RETRACT EXIT DEVICE LATCH AND ENTER BUILDING. TO EXIT - USER PRESENTS CREDENTIAL, MAG LOCKS RELEASE, USER PUSHES EXIT DEVICE PUSH BAR TO RELEASE LATCH AND EXIT BUILDING. INTERFACE REQUIRED WITH FIRE-LIFE SAFETY SYSTEM REQUIRED FOR RELEASE OF MAG LOCKS IN THE EVENT OF A FIRE. DOOR POSITIONS MAY BE MONITORED THROUGH MAG LOCKS.

Utah State Hospital Consolidation  
Department of Human Services  
1300 East Center Street  
Provo, Utah

Bid Documents

HW SET: AL-05 Pediatric Facility

1	EA	CONTINUOUS HINGE	112HD	628	IVE
1	EA	PANIC HARDWARE	98L-NL 996L	626	VON
1	EA	RIM CYLINDER	80-329 EV 29	626	SCH
1	EA	SURFACE CLOSER	4040XP EDA X 18PA	689	LCN
1	EA	OVERHEAD STOP	100S-ADJ	630	GLY
1			DOOR ID LABEL		TBD
1			THRESHOLD AND PERIMETER SEAL BY DOOR MFG		

END OF SECTION 08 7100

## SECTION 08 8000 - GLAZING

### PART 1 - GENERAL

#### 1.1 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. Windows.
  2. Doors.
  3. Glazed curtain walls.
  4. Storefront framing.
  5. Glazed entrances.
  6. Interior borrowed lites.
  7. Fire rated glazed doors and interior framing.
  8. Monolithic polycarbonate glazing.
  9. Symmetrical glass-clad polycarbonate units at seclusion room doors.

#### 1.2 PREINSTALLATION CONFERENCE

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

#### 1.3 PRECONSTRUCTION TESTING

- A. Preconstruction Adhesion and Compatibility Testing: Test each glazing material type, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.
1. Testing will not be required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each glass or plastic product and glazing material indicated.
- B. LEED Submittals:
1. Product Data for Credit EQ 4.1: For glazing sealants used inside of the weatherproofing system, including printed statement of VOC content.

- C. Glass Samples: For each type of glass or plastic glazing product other than clear monolithic vision glass; 12 inches square.
- D. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.
- E. 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. Qualification Data: For installers and manufacturers of insulating-glass units with sputter-coated, low-e coatings
- B. Material Test Reports: For plastic glazing.
- C. Preconstruction adhesion and compatibility test report.
- D. Warranties: Sample of special warranties.

#### 1.6 MAINTENANCE MATERIALS SUBMITTALS

- A. For glass that is fabricated to size and is not normally in stock in the Salt Lake area, provide 2 pieces or 2 percent of total quantity used on project (whichever is larger) for Owner's stock. Deliver to Owner in crates.

#### 1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved by coated-glass manufacturer.
- B. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.
- C. Source Limitations for Glass: Obtain the following from a single manufacturer for each glass type: glass-clad polycarbonate.
- D. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.
- E. 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. GANA Publications: GANA's "Laminated Glass Design Guide" and GANA's "Glazing Manual."

2. AAMA Publications: AAMA GDSG-1, "Glass Design for Sloped Glazing," and AAMA TIR-A7, "Sloped Glazing Guidelines."
  3. IGMA Publication for Sloped Glazing: IGMA TB-3001, "Guidelines for Sloped Glazing."
  4. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
- F. 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. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- G. Fire-Protection-Rated Glazing Labeling: Permanently mark fire-protection-rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, test standard, whether glazing is for use in fire doors or other openings, whether or not glazing passes hose-stream test, whether or not glazing has a temperature rise rating of 450 deg F, and the fire-resistance rating in minutes.
- H. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.
- I. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Install glazing in mockups specified in Section 08 4113 "Aluminum-Framed Entrances and Storefronts" Section 08 4426 "Structural Sealant Glazed Curtain Walls" to match glazing systems required for Project, including glazing methods.
  2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

## 1.8 WARRANTY

- A. Manufacturer's Special 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 Special Warranty on Laminated Glass: Manufacturer's standard form in which laminated-glass manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1. Warranty Period: 5 years from date of Substantial Completion.
- C. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form in which insulating-glass manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.
1. Warranty Period: 10 years from date of Substantial Completion.
- D. Manufacturer's Special Warranty for Abrasion- and UV-Resistant, Polycarbonate Sheet: Manufacturer's standard form, made out to Owner and signed by polycarbonate manufacturer, in which manufacturer agrees to replace polycarbonate sheet that breaks or develops defects from normal use that are attributable to the manufacturing process and not to practices for maintaining and cleaning plastic glazing sheet contrary to manufacturer's written instructions. Defects include coating delamination, increases in haze, excessive yellowing, and losses in light transmission beyond the limits stated in plastic glazing sheet manufacturer's standard form.
1. Warranty Period: 10 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 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. Provide plastic glazing sheets and glazing materials capable of withstanding normal temperature changes, wind and impact loads without failure, including loss or breakage of plastic sheets attributable to the following: failure of sealants or gaskets to remain watertight and airtight, deterioration of plastic sheet and glazing materials, or other defects in materials and installation.
- C. Thicknesses of glazing materials indicated are minimums and are for detailing only. Confirm glazing material thicknesses by analyzing Project loads and in-service conditions. Provide glazing material for various size openings in nominal thicknesses indicated, but not less than thicknesses and in strengths required to meet or exceed performance criteria.
- D. Delegated Design: Design glass, including comprehensive engineering analysis according to ASTM E 1300 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.

- a. Wind Design Data: As indicated on Drawings.
  - b. Basic Wind Speed: 90 mph.
  - c. Importance Factor: 1.15.
  - d. Exposure Category: C.
2. Design Snow Loads: As indicated on Drawings.
  3. 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.
  4. Sloped Glazing: For glass surfaces sloped more than 15 degrees from vertical, design glass to resist each of the following combinations of loads:
    - a. Outward design wind pressure minus the weight of the glass. Base design on glass type factors for short-duration load.
    - b. Inward design wind pressure plus the weight of the glass plus half of the design snow load. Base design on glass type factors for short-duration load.
    - c. Half of the inward design wind pressure plus the weight of the glass plus the design snow load. Base design on glass type factors for long-duration load.
  5. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.
- E. 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.

## 2.2 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.
  2. Thickness of Tinted Glass: Provide same thickness for each tint color indicated throughout Project.
- B. Strength: Where float glass is indicated, provide annealed float glass, Kind HS heat-treated float glass, or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened glass is indicated, provide Kind HS heat-treated float glass or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where fully tempered glass is indicated, provide Kind FT heat-treated float glass.
- C. Windborne-Debris-Impact Resistance: Provide exterior glazing that passes enhanced-protection testing requirements in ASTM E 1996 for Wind Zone 1 when tested according to ASTM E 1886. Test specimens shall be no smaller in width and length than glazing indicated for use on the Project and shall be installed in same manner as glazing indicated for use on the Project.

1. Large-Missile Test: For all glazing.
- D. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
1. For monolithic-glass lites, properties are based on units with lites 6.0 mm thick.
  2. For laminated-glass lites, properties are based on products of construction indicated.
  3. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
  4. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F.
  5. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
  6. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

## 2.3 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.
- C. Ceramic-Coated Spandrel Glass: ASTM C 1048, Condition B, Type I, Quality-Q3, and complying with other requirements specified.
1. Glass: Tinted tempered float.
  2. Tint Color: Matching insulating glass units.
  3. Ceramic Coating Color: As selected by Architect from manufacturer's full range.
- D. Glass-Clad Polycarbonate: ASTM C 1349, kinds and other requirements as specified in other Part 2 articles.
- E. Reflective-Coated Vision Glass: ASTM C 1376, coated by vacuum deposition (sputter-coating) process, and complying with other requirements specified.
1. Basis-of-Design Product: Subject to compliance with requirements, **Solarban 60 SOLARCOOL (2) gray + low-E as provided by PPG Industries Inc.** or equivalent product complying with requirements, and approved in writing prior to bidding, by another manufacturer. Contractor to remove lite from existing building during demolition to verify match to existing exterior glazing.
  2. Kind: Kind CV (coated vision glass).
  3. Coating Color: Gray.
  4. Glass: Clear float.

## 2.4 MONOLITHIC POLYCARBONATE GLAZING

- A. Coated Monolithic Polycarbonate Sheet: ASTM C 1349, Appendix X1, Type II (coated mar-resistant, UV stabilized) with coating on both sides.
1. Available Products:
    - a. ATOFINA Chemicals, Inc., ATOGLAS Division; Tuffak CM-2.
    - b. GE Structured Products; Lexan MR 10.
    - c. Sheffield Plastics Inc.; Makrolon AR.
  2. Nominal Thickness: 1/4 inch, unless indicated otherwise.
  3. Color: Transparent colorless.

## 2.5 LAMINATED GLASS

- A. Laminated Glass: ASTM C 1172, and complying with testing requirements in 16 CFR 1201 for Category II materials, and with other requirements specified. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.
1. Construction: Laminate glass with polyvinyl butyral interlayer to comply with interlayer manufacturer's written recommendations.
  2. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
  3. Interlayer Color: Clear unless otherwise indicated.
  4. Tolerances for tempered laminated glazing:
    - a. Peak to Valley Rollerwave: Maximum 0.003 inches in central area and 0.008 inch within 10.5 inches of leading and trailing edge.
    - b. Bow and Warp: Maximum 1/32 inch per lineal foot.

## 2.6 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.
  2. Spacer: Manufacturer's standard spacer material and construction.
  3. Basis-of-Design Product for Insulating-Laminated Glass: Subject to compliance with requirements, provide **SOLARCOOL (2) gray + low-E glass** as provide by **PPG Industries, Inc**; or an equivalent product, compatible with framing system and approved in writing by Architect prior to bidding, by another manufacturer.

- B. Glass: Comply with applicable requirements in "Glass Products" Article and in "Laminated Glass" Article as indicated by designations in "Insulating-Glass Types" Article and in "Insulating-Laminated-Glass Types" Article.

## 2.7 FIRE-PROTECTION-RATED GLAZING

- A. Fire-Protection-Rated Glazing, General: Listed and labeled by a testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 252 for door assemblies and NFPA 257 for window assemblies.
- B. Laminated Ceramic Glazing: Laminated glass made from 2 plies of clear, ceramic flat glass; 5/16-inch total nominal thickness; complying with testing requirements in 16 CFR 1201 for Category II materials.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Nippon Electric Glass Co., Ltd. (distributed by Technical Glass Products); FireLite Plus.
    - b. Schott North America, Inc.; Laminated Pyran Crystal.
    - c. Vetrotech Saint-Gobain; SGG Keralite FR-L.
- C. Laminated Glass with Intumescent Interlayers: Laminated glass made from multiple plies of uncoated, clear float glass; with intumescent interlayers; complying with testing requirements in 16 CFR 1201 for Category II materials.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. InterEdge, Inc., a subsidiary of AFG Industries, Inc.; Pyrobel.
    - b. Pilkington Group Limited (distributed by Technical Glass Products); PyroStop.
    - c. Vetrotech Saint-Gobain; SGG Contraflam N2.

## 2.8 SYMMETRICAL GLASS-CLAD POLYCARBONATE UNITS

- A. Glass-Clad Polycarbonate Units GCP-13: GCP, SC (Single Core) consisting of outer and inner lites of heat-strengthened float glass with an interior core consisting of one lite of polycarbonate sheet.
- B. Polycarbonate Sheet: ASTM C 1349, Appendix X1, type as specified in other Part 2 articles.
- C. Interlayer for Laminated-Polycarbonate Units: Clear polyurethane interlayer with a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after laminating polycarbonate sheets and installation.
- D. Fabrication: Laminate polycarbonate sheets to interlayer to produce laminated units free of foreign substances, air, and glass pockets.

## 2.9 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.

## 2.10 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. Elastomeric Glazing Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates. Refer to Division 7 Section "Joint Sealants."
- C. Glazing Sealants for Fire-Rated Glazing Products: Products that are approved by testing agencies that listed and labeled fire-resistant glazing products with which they are used for applications and fire-protection ratings indicated.

## 2.11 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.

## 2.12 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.
- G. Perimeter Insulation for Fire-Resistive Glazing: Product that is approved by testing agency that listed and labeled fire-resistant glazing product with which it is used for application and fire-protection rating indicated.

## 2.13 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.

- B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.
- C. Grind smooth and polish exposed glass edges and corners.

#### 2.14 INSULATING-GLASS TYPES

A. **Glass Type GL-01:** Low-e-coated, tinted insulating glass.

- 1. Overall Unit Thickness: 1 inch.
- 2. Thickness of Each Glass Lite: 6.0 mm.
- 3. Outdoor Lite: Tinted heat-strengthened float glass.
- 4. Interspace Content: Air.
- 5. Indoor Lite: Clear heat-strengthened float glass.
- 6. Low-E Coating: Sputtered on second surface.
- 7. Visible Light Transmittance: 16 percent minimum.
- 8. Winter Nighttime U-Factor: 0.48 maximum.
- 9. Summer Daytime U-Factor: 0.5 maximum.
- 10. Solar Heat Gain Coefficient: 0.31 maximum.
- 11. Provide safety glazing labeling.

B. **Glass Type GL-02:** Low-e-coated, tempered, tinted insulating glass.

- 1. Overall Unit Thickness: 1 inch.
- 2. Thickness of Each Glass Lite: 6.0 mm.
- 3. Outdoor Lite: Tinted fully tempered float glass.
- 4. Interspace Content: Air.
- 5. Indoor Lite: Clear fully tempered float glass.
- 6. Low-E Coating: Sputtered on second surface.
- 7. Visible Light Transmittance: 16 percent minimum.
- 8. Winter Nighttime U-Factor: 0.48 maximum.
- 9. Summer Daytime U-Factor: 0.5 maximum.
- 10. Solar Heat Gain Coefficient: 0.31 maximum.
- 11. Provide safety glazing labeling.

#### 2.15 INSULATING-LAMINATED-GLASS TYPE

A. **Glass Type GL-03:** Low-e-coated, tinted, insulating laminated glass.

- 1. Overall Unit Thickness: 1 inch.
- 2. Thickness of Outdoor Lite: 6.0 mm.
- 3. Outdoor Lite: Tinted fully tempered float glass.
- 4. Interspace Content: Air.
- 5. Indoor Lite: Clear laminated glass with two plies of fully tempered float glass.
  - a. Thickness of Each Glass Ply: 6.0 mm.
  - b. Interlayer Thickness: 0.060 inch.

6. Low-E Coating: Sputtered on second surface.
7. Visible Light Transmittance: 16 percent minimum.
8. Winter Nighttime U-Factor: 0.48 maximum.
9. Summer Daytime U-Factor: 0.5 maximum.
10. Solar Heat Gain Coefficient: 0.31 maximum.
11. Provide safety glazing labeling.

#### 2.16 MONOLITHIC-GLASS TYPES

A. **Glass Type GL-04:** Clear float glass.

1. Thickness: 6.0 mm.

B. **Glass Type GL-04A:** Frosted float glass.

1. Thickness: 6.0 mm.
2. Translucent Film: Outside surface.

C. **Glass Type GL-05:** Clear fully tempered float glass.

1. Thickness: 6.0 mm.
2. Provide safety glazing labeling.

D. **Glass Type GL-05A:** Frosted fully tempered float glass.

1. Thickness: 6.0 mm.
2. Provide safety glazing labeling.
3. Translucent Film: Outside surface.

#### 2.17 MONOLITHIC POLYCARBONATE GLAZING

A. **Glazing Type GL-06:** Coated Monolithic Polycarbonate Sheet: Coated mar-resistant, UV stabilized, with coating on both sides.

1. Nominal Thickness: 1/4 inch, unless indicated otherwise.
2. Color: Transparent colorless.

#### 2.18 LAMINATED-GLASS TYPE

A. **Glass Type GL-07:** Clear laminated glass with two plies of fully tempered float glass.

1. Thickness of Each Glass Ply: 6.0 mm.
2. Interlayer Thickness: 0.060 inch.
3. Provide safety glazing labeling.

B. **Glass Type GL-07A:** Frosted laminated glass with two plies of fully tempered float glass.

1. Thickness of Each Glass Ply: 6.0 mm.
2. Interlayer Thickness: 0.060 inch arctic white lami.
3. Provide safety glazing labeling.

C. **Glass Type GL-08:** Reflective-coated, laminated vision glass with two plies of fully tempered float glass with inner ply Class 1 (clear).

1. Thickness of Each Glass Ply: 6.0 mm.
2. Interlayer Thickness: 0.060 inch.
3. Coating Location: Second surface.
4. Provide safety glazing labeling.

#### 2.19 FIRE-PROTECTION-RATED GLAZING TYPES

A. **Glass Type GL-09:** 20-minute fire-rated glazing with hose-stream test; laminated ceramic glazing.

B. **Glass Type GL-10:** 45-minute fire-rated glazing; laminated glass with intumescent interlayers.

1. Provide safety glazing labeling.

C. **Glass Type GL-11:** 90-minute fire-rated glazing; laminated glass with intumescent interlayers.

1. Provide safety glazing labeling.

#### 2.20 INSULATING-SPANDREL GLASS TYPES

A. **Glass Type GL-12:** Ceramic-coated, tinted, low-e, insulating spandrel glass.

1. Overall Unit Thickness: 1 inch.
2. Thickness of Each Glass Lite: 6.0 mm.
3. Outdoor Lite: Fully tempered float glass.
4. Interspace Content: Air.
5. Indoor Lite: Fully tempered float glass.
6. Low-E Coating: Sputtered on second surface.
7. Opaque Coating Location: Fourth surface.

#### 2.21 SYMMETRICAL GLASS-CLAD POLYCARBONATE UNITS

A. **Glass Type GL-13:** Heat-strengthened glass symmetrically clad to both sides of polycarbonate sheet.

1. Basis of Design Product: **Viracon; 9/16 inch Guardview 200 HS/HS.**
2. Overall Unit Thickness: As determined by thicknesses of lites and interlayers.
3. Outer Lite: Class 1 (clear) float glass.

- a. Thickness: 3 mm.
4. Single Core: Type I (standard, UV-stabilized) polycarbonate sheet.
  - a. Thickness: 6 mm.
5. Inner Lite: Class 1 (clear) float glass of the following thickness: 3 mm.
6. Interlayer Thickness: 0.050 inch.

### 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.

### 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. Apply heel bead of elastomeric sealant.
- F. 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.
- G. Apply cap bead of elastomeric sealant over exposed edge of tape.

### 3.5 GASKET GLAZING (DRY)

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

### 3.6 SEALANT GLAZING (WET)

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

### 3.7 CLEANING AND PROTECTION

- A. 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 and plastic glazing 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 08 8000

## SECTION 08 9119 - FIXED LOUVERS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Fixed, formed-metal louvers.

#### 1.2 DEFINITIONS

- A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.
- B. Horizontal Louver: Louver with horizontal blades (i.e., the axes of the blades are horizontal).
- C. Drainable-Blade Louver: Louver with blades having gutters that collect water and drain it to channels in jambs and mullions, which carry it to bottom of unit and away from opening.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.
- B. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other work. Show frame profiles and blade profiles, angles, and spacing.
  - 1. Show weep paths, gaskets, flashing, sealant, and other means of preventing water intrusion.
  - 2. Show mullion profiles and locations.
- C. Samples: For each type of metal finish required.
- D. Delegated-Design Submittal: For louvers indicated to comply with structural and seismic performance requirements, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: Based on evaluation of comprehensive tests performed according to AMCA 500-L by a qualified testing agency or by manufacturer and witnessed by a qualified

testing agency, for each type of louver and showing compliance with performance requirements specified.

- B. Windborne-debris-impact-resistance test reports.

## 1.5 QUALITY ASSURANCE

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

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

## 1.6 FIELD CONDITIONS

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

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Source Limitations: Obtain louvers from single source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.

### 2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design louvers, including comprehensive engineering analysis by a qualified professional engineer, using structural and seismic performance requirements and design criteria indicated.
- B. Structural Performance: Louvers shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver-blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures shall be considered to act normal to the face of the building.
  - 1. Wind Loads: Determine loads based on a uniform pressure of 30 lbf/sq. ft., acting inward or outward.
- C. Windborne-Debris-Impact Resistance: Louvers located within 30 feet of grade shall pass enhanced-protection, large-missile testing requirements in ASTM E 1996 for Wind Zone 1 when tested according to ASTM E 1886. Test specimens shall be no smaller in width and length than louvers indicated for use on Project.
- D. Seismic Performance: Louvers, including attachments to other construction, shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. Design earthquake spectral response acceleration, short period (Sds) for Project is 0.834 g..
2. Component Importance Factor: 1.25.

E. Louver Performance Ratings: Provide louvers complying with requirements specified, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width according to AMCA 500-L.

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

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

G. SMACNA Standard: Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.

### 2.3 FIXED, FORMED-METAL LOUVERS

A. Horizontal, Drainable-Blade Louver:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Airolite Company, LLC (The).
  - b. Construction Specialties, Inc.
  - c. Industrial Louvers, Inc.
2. Louver Depth: 6 inches.
3. Frame and Blade Material and Nominal Thickness: Galvanized-steel sheet, not less than 0.052 inch for frames and 0.040 inch for blades.
4. Mullion Type: Exposed.
5. Louver Performance Ratings:
6. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

### 2.4 LOUVER SCREENS

A. General: Provide screen at each exterior louver.

1. Screen Location for Fixed Louvers: Interior face.
2. Screening Type: Insect screening.

B. Secure screen frames to louver frames with stainless-steel machine screws, spaced a maximum of 6 inches from each corner and at 12 inches o.c.

C. Louver Screen Frames: Fabricate with mitered corners to louver sizes indicated.

1. Metal: Same type and form of metal as indicated for louver to which screens are attached.
2. Finish: Same finish as louver frames to which louver screens are attached.
3. Type: Rewirable frames with a driven spline or insert.

D. Louver Screening for Galvanized-Steel Louvers:

1. Insect Screening: Galvanized steel, 18-by-14 mesh, 0.011-inch wire.

2.5 GALVANIZED-STEEL SHEET FINISHES

- A. Finish louvers after assembly.
- B. Surface Preparation: Clean surfaces with nonpetroleum solvent so surfaces are free of oil and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas and repair according to ASTM A 780.
- C. Baked-Enamel or Powder-Coat Finish: Immediately after cleaning and pretreating, apply manufacturer's standard 2-coat, baked-on finish consisting of prime coat and thermosetting topcoat, with a minimum dry film thickness of 1 mil for topcoat. Comply with coating manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils.
  1. Color and Gloss: Match color of aluminum framing systems.

2.6 MATERIALS

- A. Galvanized-Steel Sheet: ASTM A 653/A 653M, G60 zinc coating, mill phosphatized.
- B. Fasteners: Use types and sizes to suit unit installation conditions.
  1. Use tamper-resistant screws for exposed fasteners unless otherwise indicated.
  2. For fastening galvanized steel, use hot-dip-galvanized steel or 300 series stainless-steel fasteners.
  3. For color-finished louvers, use fasteners with heads that match color of louvers.
- C. Postinstalled Fasteners for Masonry: Torque-controlled expansion anchors, made from stainless-steel components, with capability to sustain, without failure, a load equal to 4 times the loads imposed, for concrete, or 6 times the load imposed for masonry, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
- D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

## 2.7 FABRICATION

- A. Factory assemble louvers to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- B. Vertical Assemblies: Where height of louver units exceeds fabrication and handling limitations, fabricate units to permit field-bolted assembly with close-fitting joints in jambs and mullions, reinforced with splice plates.
  - 1. Continuous Vertical Assemblies: Fabricate units without interrupting blade-spacing pattern unless horizontal mullions are indicated.
- C. Maintain equal louver blade spacing, including separation between blades and frames at head and sill, to produce uniform appearance.
- D. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.
  - 1. Frame Type: Channel unless otherwise indicated.
- E. Include supports, anchorages, and accessories required for complete assembly.
- F. Provide vertical mullions of type and at spacings indicated, but not more than is recommended by manufacturer, or 72 inches o.c., whichever is less.
  - 1. Semirecessed Mullions: Where indicated, provide mullions partly recessed behind louver blades so louver blades appear continuous. Where length of louver exceeds fabrication and handling limitations, fabricate with interlocking split mullions and close-fitting blade splices designed to permit expansion and contraction.
  - 2. Exterior Corners: Prefabricated corner units with mitered and welded blades and with semirecessed mullions at corners.
- G. Provide subsills made of same material as louvers for recessed louvers.
- H. Join frame members to each other and to fixed louver blades with fillet welds concealed from view unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and openings, 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. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

### 3.3 INSTALLATION

- A. Locate and place louvers level, plumb, and at indicated alignment with adjacent work.
- B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.
- C. Form closely fitted joints with exposed connections accurately located and secured.
- D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.
- E. Protect unpainted galvanized and nonferrous-metal surfaces that are in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint or by separating surfaces with waterproof gaskets or nonmetallic flashing.
- F. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Section 079200 "Joint Sealants" for sealants applied during louver installation.

### 3.4 ADJUSTING AND CLEANING

- A. Clean exposed louver surfaces that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate during construction period.
- B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.
- C. Restore louvers damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.
  - 1. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

END OF SECTION 08 9119