

CORNERSTONE

PROJECT NO. 1918

PROJECT MANUAL - VOLUME 1 OF 1
SPECIFICATIONS DIVISIONS 01 - 33

BID SET
NOVEMBER 18, 2021

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PROJECT MANUAL – VOLUME 1 OF 1

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- NOT USED -

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- NOT USED -

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*As determined by Electrical Engineer
; refer to Drawings*

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*As determined by Electrical Engineer
; refer to Drawings*

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As determined by Civil Engineer; refer to Drawings

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*As determined by Civil Engineer
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As determined by Civil Engineer; refer to Drawings

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SECTION 01 10 00 - SUMMARY

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Project information.
 - 2. Owner-furnished products.
 - 3. Work by Owner.
 - 4. Access to site and premises.
 - 5. Work restrictions.
 - 6. Owner Occupancy.
 - 7. Specification and Drawing conventions.

1.2 PROJECT

- A. Project Name: Cornerstone.
- B. Owner: Mutual Housing of California, 3321 Power Inn Rd., Suite 320, Sacramento, CA 95826.
- C. Architect: Salazar Architect Inc., 3050 SE Division St., Suite 240, Portland, OR 97202.
- A. New three-story walkup affordable multifamily apartments and a separate one-story community building.

1.3 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: As indicated.

1.4 WORK BY OWNER

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

1.5 CONTRACTOR USE OF SITE AND PREMISES

- A. Provide access to and from site as required by law and by Owner:
 - 1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
 - 2. Do not obstruct roadways, sidewalks, or other public ways without permit.
 - 3. Coordinate with Owner for required access during construction.

1.6 WORK RESTRICTIONS

- A. On-Site Work Hours: Work shall be generally performed during normal business working hours as set forth by the City of Portland and the Owner.

1.7 OWNER OCCUPANCY

- A. Owner does not intend to occupy the Project during construction.

1.8 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. Abbreviations and Acronyms: See Drawings for standard and general abbreviations and acronyms.
 - 3. Keynoting: See Drawings for Keynoting definitions. Materials and products are identified by reference acronyms, unless indicated otherwise.

PART 2 - PRODUCTS

- NOT USED -

PART 3 - EXECUTION

- NOT USED -

END OF SECTION

SECTION 01 20 00 - PRICE AND PAYMENT PROCEDURES

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. Procedures for preparation and submittal of applications for progress payments.
 - 2. Procedures for preparation and submittal of application for final payment.
- B. Related Requirements:
 - 1. Division 00 "Procurement and Contracting Requirements": For Contracting Forms and Supplements to be referenced and used.
 - 2. Documentation of changes in Contract Sum and Contract Time: Refer to Section 01 26 00 "Contract Modification Procedures."

1.3 SCHEDULE OF VALUES

- A. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect for approval.
- B. Forms filled out by hand will not be accepted.
- C. Submit Schedule of Values in duplicate within 15 days after date of Owner-Contractor Agreement.
- D. Format: Utilize the Table of Contents of this Project Manual. Identify each line item with number and title of the specification Section. Identify site mobilization.
- E. Revise schedule to list approved Change Orders, with each Application for Payment.

1.4 APPLICATIONS FOR PROGRESS PAYMENTS

- A. Payment Period: Submit at intervals stipulated in the Agreement.
- B. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect for approval.
- C. Forms filled out by hand will not be accepted.
- D. For each item, provide a column for listing each of the following:
 - 1. Item Number.
 - 2. Description of work.
 - 3. Scheduled Values.
 - 4. Previous Applications.
 - 5. Work in Place and Stored Materials under this Application.
 - 6. Authorized Change Orders.
 - 7. Total Completed and Stored to Date of Application.
 - 8. Percentage of Completion.
 - 9. Balance to Finish.

10. Retainage.

- E. Execute certification by signature of authorized officer.
- F. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored products.
- G. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of Work.
- H. Submit three copies of each Application for Payment.
- I. Include the following with the application:
 - 1. Construction progress schedule, revised and current as specified in Section 01 30 00 "Administrative Requirements".
- J. When Architect requires substantiating information, submit data justifying dollar amounts in question. Provide one copy of data with cover letter for each copy of submittal. Show application number and date, and line item by number and description.

1.5 APPLICATION FOR FINAL PAYMENT

- A. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
 - 1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
 - 2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- B. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Sum, previous payments, and sum remaining due.
- C. Application for Final Payment will not be considered until the following have been accomplished:
 - 1. All closeout procedures specified in Section 01 70 00 "Execution and Closeout Requirements".

PART 2 - PRODUCTS

- NOT USED -

PART 3 - EXECUTION

- NOT USED -

END OF SECTION

SECTION 01 25 00 - PRODUCT SUBSTITUTION PROCEDURES

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 general requirements for the Work in relation to substitutions and product options.

1.3 REQUESTS FOR SUBSTITUTIONS

- A. Requests for substitution of products in place of those specified shall be in accordance with Instructions to Bidders, and as specified herein.
- B. Requests for substitution shall be submitted by subcontractors to the General Contractor, not the Architect.
- C. Requests for substitution shall be submitted to the Architect only by the General Contractor.

1.4 CONTRACTOR'S RESPONSIBILITIES

- A. Review the request for substitution for adherence to the requirements herein and applicability and appropriateness to the Project requirements. Only submit to the Architect those requests for substitution which meet the requirements.
- B. Investigate proposed substitution products and determine that they are equal or superior in all respects to products specified.
- C. Provide same guarantee for accepted substitutions as for products specified.
- D. Coordinate installation of accepted substitutions into the Work, making such changes as may be required for the Work to be complete in all respects, without additional cost to the Owner or the design team.

1.5 SUBSTITUTIONS DURING BIDDING

- A. Submit the following information with each request to the Architect:
 - 1. Provide the CSI Substitution Request Form for the Bid Phase, appended here.
 - 2. Comparison of proposed substitution with product, material or system specified.
 - 3. Complete data, substantiating compliance of proposed substitution with the Contract Documents.
 - 4. Test numbers and supporting reports, indicating compliance with referenced standards.
 - 5. Evidence that warranty requirements are acceptable.
 - 6. Details indicating specific deviations proposed for the substitution.
 - 7. Reference and applicable Specification sections.
 - 8. Applicable product samples.
- B. All substitution requests shall be received in the Architect's office no less than 10 calendar days before bid closing. Requests received after this date will not be considered.

1.6 SUBSTITUTIONS DURING CONSTRUCTION

- A. Substitutions will normally not be considered after date of Contract except when required due to unforeseen circumstances.
- B. Within a period of 30 days after date of Contract, the Owner may, at its option, consider formal written requests for substitution of products in place of those specified, when submitted in accordance with the requirements stipulated herein.
- C. One or more of the following conditions must be documented and substantiated in any such request:
 - 1. Specified product is no longer available.
 - 2. Specified product is no longer compatible, due to changes in the design during construction.
 - 3. A change in governing regulatory requirements makes a revision in design or material usage mandatory.
 - 4. Substitution offers the owner a substantial advantage in cost, time, energy conservation, or other considerations (provide substantiation for review).
- D. If one or more of the conditions indicated above can be documented and substantiated, follow the submittal requirements of the paragraphs at SUBSTITUTIONS DURING BIDDING, EXCEPT:
 - 1. Provide the CSI Substitution Request Form as revised and appended here, for the Construction Administration Phase.
 - 2. All substitution requests shall be received in the Architect's office no less than 30 calendar days before scheduled delivery of submittals for the original product or material. Requests received after this date will not be considered.

1.7 SUBSTITUTIONS NOT PERMITTED

- A. Products implied on submittals which have not been specified or approved through the proper substitution process, either during bidding or during construction administration will be rejected.
- B. Substitutions will be rejected if acceptance will require substantial revision of the Contract Documents, and the submitter has not indicated intent or ability to compensate the design team for such revisions.

1.8 FORMS

- A. Utilize the CSI Substitution Request Form as revised and appended to This section, for the appropriate Project phase:
 - 1. Substitution Request Form for Substitution Requests During Bid Phase.
 - 2. Substitution Request Form for Substitution Requests During Construction Administration Phase.

PART 2 - PRODUCTS

- NOT USED -

PART 3 - EXECUTION

- NOT USED -

END OF SECTION

**SUBSTITUTION REQUEST FORM
For Substitution Requests Prior to Bidding**

Advancement of Construction Technology
The Construction Specifications Institute

TO: _____

PROJECT: _____

SPECIFIED ITEM: _____

Section	Page	Paragraph	Description
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The undersigned requests consideration of the following:

PROPOSED SUBSTITUTION: _____

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

Attached data also includes description of changes to Contract Documents which proposed substitution will require for its proper installation.

The undersigned states that the following paragraphs, unless modified on attachments, are ALL correct:

1. THE PROPOSED SUBSTITUTION DOES NOT AFFECT DIMENSIONS SHOWN ON DRAWINGS.
2. THE UNDERSIGNED WILL PAY FOR CHANGES TO THE BUILDING DESIGN, INCLUDING ENGINEERING DESIGN, DETAILING AND CONSTRUCTION COSTS CAUSED BY THE REQUESTED SUBSTITUTION.
3. THE PROPOSED SUBSTITUTION WILL HAVE NO ADVERSE EFFECT ON OTHER TRADES, THE CONSTRUCTION SCHEDULE, OR SPECIFIED WARRANTY REQUIREMENTS.
4. MAINTENANCE AND SERVICE PARTS WILL BE LOCALLY AVAILABLE FOR THE PROPOSED SUBSTITUTION.

The undersigned further states that the function, appearance and quality of the Proposed Substitution are equivalent or superior to the Specified Item.

Submitted By: _____

For use by Design Consultant:

Signature: _____

Firm: _____

Address: _____

Date: _____

Telephone: _____

Attachments: _____

<input type="checkbox"/>	<input type="checkbox"/>
Accepted	Accepted as noted
<input type="checkbox"/>	<input type="checkbox"/>
Not Accepted	Received too late

By: _____

Date: _____

Remarks: _____

SUBSTITUTION REQUEST FORM
For Substitution Requests During
Construction Administration

Advancement of Construction Technology
The Construction Specifications Institute

TO: _____

PROJECT: _____

SPECIFIED ITEM: _____

Section	Page	Paragraph	Description
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The undersigned requests consideration of the following:

PROPOSED SUBSTITUTION: _____

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

Attached data also includes description of changes to Contract Documents which proposed substitution will require for its proper installation.

Substitutions for After Bidding: The undersigned states that the substitution is requested DUE TO AT LEAST ONE of the following conditions (indicate and substantiate condition in attachments; failure to identify one of these conditions will result in rejection of the substitution):

1. SPECIFIED PRODUCT IS NO LONGER AVAILABLE.
2. SPECIFIED PRODUCT IS NO LONGER COMPATIBLE, DUE TO CHANGES IN THE DESIGN DURING CONSTRUCTION.
3. A CHANGE IN GOVERNING REGULATORY REQUIREMENTS MAKES A REVISION IN DESIGN OR MATERIAL USAGE MANDATORY.
4. SUBSTITUTION OFFERS THE OWNER A SUBSTANTIAL ADVANTAGE IN COST, TIME, ENERGY CONSERVATION, OR OTHER CONSIDERATIONS (Provide substantiation for review).

The undersigned further states that the function, appearance and quality of the Proposed Substitution are equivalent or superior to the Specified Item.

Submitted By: _____

For use by Design Consultant:

Signature: _____

Firm: _____

Address: _____

Date: _____

Telephone: _____

Attachments: _____

<input type="checkbox"/>	<input type="checkbox"/>
Accepted	Accepted as noted
<input type="checkbox"/>	<input type="checkbox"/>
Not Accepted	Received too late

By: _____

Date: _____

Remarks: _____

SECTION 01 26 00 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements for handling and processing Contract modifications.
- B. Related Sections include the following:
 - 1. Section 01 25 00 "Product Substitution Procedures" for administrative procedures for handling requests for substitutions made after Contract award.

1.3 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. Architect will issue instructions directly to Contractor.

1.4 MODIFICATION PROCEDURES, GENERAL

- A. For changes involving adjustment to the Contract Sum or the Contract Time, Architect will issue a document signed by the Owner instructing Contractor to proceed with the change, for subsequent inclusion in a Change Order.
 - 1. The document will describe the required changes and will designate method of determining any change in Contract Sum or Contract Time.
 - 2. Promptly execute the change.
- B. For changes for which advance pricing is desired, Architect will issue a proposal request. Contractor shall prepare and submit a fixed price quotation within 14 days.
- C. Contractor may propose a change by submitting a request for change to Architect, describing the proposed change and its full effect on the Work, with a statement describing the reason for the change, and the effect on the Contract Sum and Contract Time with full documentation and a statement describing the effect on Work by separate or other contractors. Document any requested substitutions in accordance with Section 01 25 00. See "Contractor-Initiated Proposals" Article below for outlined requirements.
- D. On Owner's approval of a Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on AIA Document G701. Change orders shall be consolidated on a monthly basis.
- E. For change orders, presentation of costs need to be per approved allocation format of Schedule of Values.
- F. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.
 - 1. For change requested by Architect for work falling under a fixed price contract, the amount will be based on Contractor's price quotation.

2. For change requested by Contractor, the amount will be based on the Contractor's request for a Change Order as approved by Architect.
3. For pre-determined unit prices and quantities, the amount will be based on the fixed unit prices.
- G. Substantiation of Costs: Provide full information required for evaluation.
 1. Provide following data:
 - a. Quantities of products, labor, and equipment.
 - b. Taxes, insurance, and bonds.
 - c. Overhead and profit.
 - d. Justification for any change in Contract Time.
 - e. Credit for deletions from Contract, similarly documented.
 2. Support each claim for additional costs with additional information:
 - a. Dates and times work was performed, and by whom.
 - b. Invoices and receipts for products, equipment, and subcontracts, similarly documented.
- H. Execution of Change Orders: Architect will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.
- I. After execution of Change Order, promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum.
- J. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.
- K. Promptly enter changes in Project Record Documents.
- 1.5 PROPOSAL REQUESTS
 - A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
 1. Proposal Requests issued by Architect are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
 2. Within time specified in Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
 - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include costs of labor and supervision directly attributable to the change.
 - d. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

- B. Contractor-Initiated Proposals: If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes by submitting a request for a change to Architect.
 - 1. For proposal requests, presentation of costs need to be per approved allocation format of Schedule of Values.
 - 2. 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.
 - 3. 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.
 - 4. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - 5. Include costs of labor and supervision directly attributable to the change.
 - 6. 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.
 - 7. Comply with requirements in Division 01 Section "Product Requirements" if the proposed change requires substitution of one product or system for product or system specified.
- C. Proposal Request Form: Use AIA Document G709 for Proposal Requests.

1.6 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive:
 - 1. On Owner's approval of 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.
 - 2. 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:
 - 1. Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
 - 2. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS

- NOT USED -

PART 3 - EXECUTION

- NOT USED -

END OF SECTION

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SECTION 01 30 00 - ADMINISTRATIVE REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Preconstruction meeting.
 - 2. Progress meetings.
 - 3. Request for information/ interpretation (RFI) procedures.
 - 4. Submittal procedures.
- B. Related Requirements:
 - 1. Section 01 32 16 "Construction Progress Schedule".

1.3 PROJECT COORDINATION, GENERAL

- A. Refer to Section 01 31 13 "Project Coordination".
- B. Cooperate with the Project Coordinator in allocation of mobilization areas of site; for field offices and sheds, for Site access, traffic, and parking facilities.
- C. During construction, coordinate use of site and facilities through the Project Coordinator.
- D. Comply with Project Coordinator's procedures for intra-project communications; submittals, reports and records, schedules, coordination drawings, and recommendations; and resolution of ambiguities and conflicts.
- E. Comply with instructions of the Project Coordinator for use of temporary utilities and construction facilities.
- F. Coordinate field engineering and layout work under instructions of the Project Coordinator.
- G. Make the following types of submittals to Architect through the Project Coordinator:
 - 1. Requests for substitution.
 - 2. Requests for information/ interpretation (RFI).
 - 3. Shop drawings, product data, and samples.
 - 4. Test and inspection reports.
 - 5. Design data.
 - 6. Manufacturer's instructions and field reports.
 - 7. Applications for payment and change order requests.
 - 8. Progress schedule: Refer to Section 01 32 16 "Construction Progress Schedule".
 - 9. Coordination drawings.
 - 10. Closeout submittals.

- H. Coordination Digital Data Files, from Architect: Architect will furnish, where requested, digital data files of Drawings for use in preparing coordination drawings.
 - 1. Architect makes no representations to the accuracy or completeness of digital files provided.
 - 2. Contractor shall execute the data licensing agreement, titled "Electronic Media Agreement", appended to This section.
- I. Reviews: For submittal, RFI and other document review, see procedures below for allotted duration.
 - 1. Architect shall notify Owner and Contractor during specified review time upon receipt, during progress meetings, where additional review time is required for review.

PART 2 - PRODUCTS

- NOT USED -

PART 3 - EXECUTION

3.1 PRECONSTRUCTION MEETING

- A. Contractor shall schedule a meeting after Notice of Award.
- B. Attendance Required:
 - 1. Owner's Representative/ Project Manager.
 - 2. Architect.
 - 3. Contractor.
- C. Optional Attendance: Lender's Construction Representative, Portland Housing Bureau Representative, and Earth Advantage Representative.
- D. Agenda:
 - 1. Execution of Owner-Contractor Agreement.
 - 2. Submission of executed bonds and insurance certificates.
 - 3. Lender requirements, if required.
 - 4. Distribution of Contract Documents.
 - 5. Submission of list of Subcontractors, list of Products, schedule of values, and progress schedule.
 - 6. Designation of personnel representing the parties to Contract and Architect.
 - 7. Procedures and processing of field decisions, submittals, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
 - 8. Review Indoor Air Quality (IAQ) Management Plan.
 - 9. Scheduling.
- E. Contractor shall record minutes and distribute copies within two days after meeting to Owner, Architect, other meeting participants, and those affected by decisions made.

3.2 PROGRESS MEETINGS

- A. Schedule and administer meetings throughout progress of the Work at maximum weekly intervals.
- B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.

- C. Attendance Required: Job superintendent, major Subcontractors and suppliers, Owner, Architect, as appropriate to agenda topics for each meeting.
- D. Agenda:
 - 1. Review minutes of previous meetings.
 - 2. Review of Work progress.
 - 3. Field observations, problems, and decisions.
 - 4. Identification of problems which impede planned progress.
 - 5. Review of submittal/ RFI schedule and status of each.
 - 6. Maintenance of progress schedule.
 - 7. Corrective measures to regain projected schedules.
 - 8. Planned progress during succeeding work period.
 - 9. Maintenance of quality and work standards.
 - 10. Effect of proposed changes on progress schedule and coordination.
 - 11. Other business relating to Work.
- E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.3 CONSTRUCTION PROGRESS SCHEDULE

- A. Refer to Section 01 32 16 "Construction Progress Schedule".

3.4 COORDINATION DRAWINGS

- A. Provide information required by Project Coordinator for preparation of coordination drawings.
- B. Review drawings prior to submission to Architect.
- C. See Section 01 31 13 "Project Coordination".

3.5 REQUEST FOR INFORMATION PROCEDURES

- A. Transmit each request for information/ interpretation with Contractor's standard form, electronically submitted.
 - 1. Include drawing and/ or specification section for each item.
 - 2. Do not submit requests with multiple, unrelated scopes of work. Requests submitted that cover multiple issues or requests shall be rejected.
- B. Sequentially number form. Revise requests with original number and a sequentially alphabetic suffix.
- C. For each request and revised request, allow 14 calendar days, starting from the time received by Architect, except as follows:
 - 1. As requested during progress meetings.
- D. Identify variations from Contract Documents and Product or system limitations which may be detrimental to successful performance of the completed Work.
- E. Provide space for Contractor and Architect review.
- F. When revised for resubmission, identify all changes made since previous submission.
- G. Distribute copies of reviewed requests as appropriate. Instruct parties to promptly report any inability to comply with requirements.

3.6 SUBMITTAL PROCEDURES

- A. Transmit each submittal with a transmittal indicating date of submission, recipient and sender, and description of each item either physical samples or electronically submitted. Include submittal number and specification section for each item included in submittal.
- B. Sequentially number the transmittal form. Revise submittals with original number and a sequential alphabetic suffix.
- C. Identify Project, Contractor, Subcontractor or supplier; pertinent drawing and detail number, and specification section number, as appropriate on each copy.
- D. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of Products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with the requirements of the Work and Contract Documents.
- E. Submittals shall be in digital format only and transmitted electronically except for physical samples. Deliver samples to Architect at business address or to address request by Architect.
- F. Schedule submittals to expedite the Project, and coordinate submission of related items.
 - 1. Provide and review a submittal schedule during preconstruction meeting for review of overall schedule and during progress meetings.
 - 2. Submittal schedule shall list submittals, in chronological order of dates required by construction schedule and coordination with other work, and include all time required for review, ordering, manufacturing, fabrication and delivery dates. Include additional time for revisions and corrections.
- G. For each submittal for review and resubmittal, allow 14 calendar days, excluding delivery time to and from the Contractor, except as follows:
 - 1. As requested during progress meetings.
- H. Identify variations from Contract Documents and Product or system limitations which may be detrimental to successful performance of the completed Work.
- I. Provide space for Contractor and Architect review stamps.
- J. When revised for resubmission, identify all changes made since previous submission.
- K. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.
- L. Submittals not requested or incomplete will not be recognized or processed.
- M. Submit all submittal items required for each Specification Section concurrently in entirety, unless arrangements for staggered submittals for individual Sections has been previously authorized during progress meeting review.
- N. Submit coordinated submittals affecting other work concurrently for review.
- O. Submittal Format:
 - 1. Form of Documents: Submittals are preferred to be delivered electronically in Portable Document Format (PDF), and followed by one (1) set of printed copies, as directed.
 - a. Minimize or compress file size prior to transmitting.
 - b. If not submitting electronically, provide three (3) sets of printed copies, except provide four (4) sets for submittals requiring review by sub-consultants to the Architect.
 - 2. Documents for Review: Provide PDF and printed formats; small size sheets.
 - 3. Documents for Information: Provide PDF and printed formats; small size sheets.

4. Documents for Project Closeout: Provide PDF and printed formats; small size sheets, format not larger than 8-1/2 x 11 inches.
5. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect.
 - a. After review, produce duplicates as needed for field quality review, as directed or required.
 - b. Retained samples will not be returned to Contractor unless specifically so stated.

P. Submittals for Review:

1. When the following are specified in individual sections, submit them for review:
 - a. Product data.
 - b. Shop drawings.
 - c. Samples for selection.
 - d. Samples for verification.
2. Provide to Construction Manager for Submission to Architect, for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.
3. Samples will be reviewed only for aesthetic, color, or finish selection.
4. After review, provide copies and distribute in accordance with Submittal Procedures Article above and for record documents purposes described in Section 01 78 00 "Closeout Submittals".

Q. Product Mockups as Submittals:

1. Where Mock-Up requirements are indicated in individual sections, manage their review similar to Submittals for Review.
2. Mock-Ups as Submittals: Provide notification to Construction Manager for review by the Architect, for the purpose of conformance with quality requirements and design intent.
3. Mock-Ups will be reviewed for appearance, sequence of installation, quality of execution, and conformance with design intent as indicated in the Project Documents.
4. Upon approval, Mock-Ups will remain available on-site or at an agreed location to provide a physical example of appearance, sequence of installation, quality of execution, and conformance with design intent. Installed Work shall meet a comparable standard of quality and attention to detail as established by the Mock-Up.

R. Submittals for Information:

1. When the following are specified in individual sections, submit them for information:
 - a. Design data.
 - b. Certificates.
 - c. Test reports.
 - d. Inspection reports.
 - e. Manufacturer's instructions.
 - f. Manufacturer's field reports.
 - g. Other types indicated.
2. Submit for Architect's knowledge as contract administrator or for Owner. No action will be taken.

S. Submittals for Project Closeout

1. When the following are specified in individual sections, submit them at project closeout:
 - a. Project record documents.
 - b. Operation and maintenance data.
 - c. Warranties.
 - d. Bonds.
 - e. Other types as indicated.
2. Submit for Owner's benefit during and after project completion.

END OF SECTION

ELECTRONIC MEDIA AGREEMENT

Contractor and Subcontractor ("Recipient") have requested that the Architect provide to it certain plans, specifications and other documents in electronic form ("Electronic Form Documents"), for this project and the Architects will do so. The Recipient recognizes that Electronic Form Documents are not intended to be used for construction, are not Contract Documents under the terms of the Construction Contract, may be revised by others without the knowledge or consent of the Architect and, when plotted, may result in variances or corrupt other files of the user.

The Recipient agrees that the Electronic Form Documents will only be used for general reference only. The Recipient also agrees not to use the Electronic Form Documents as shop drawings or submittals or for any project other than the Project for which they were prepared.

The Recipient acknowledges that the Electronic Form Documents are the property of the Architect and subject to the copyright of the Architect. The Electronic Form Documents may be write-protected by the Architect such that no data on such disk can be manipulated. The Architect will provide to the Recipient only a working copy of Electronic Form Documents. Said working copy of the Electronic Form Documents shall have all indices of the Architect's ownership, professional name, and/or involvement in the Project removed from the electronic display.

Any use of any kind and/or changes to the Electronic Form Documents will be at the sole risk of the user, and without liability, risk or legal exposure to the Architect. The Recipient and any other person or entity using the Electronic Form Documents agrees to release and, to the fullest extent permitted by law, defend and indemnify the Architect, its consultants, and their partners, shareholders, agents and employees from and against any and all claims, demands, losses, expenses, damages, penalties and liabilities of any kind, including without limitation, attorney's fees, arising out of or relating in any way to any such use of or change to the Electronic Form Documents.

Under no circumstances shall the Architect deem the transfer of the Electronic Form Documents for use of the Recipient a sale, and the Architect makes no warranties, either expressed or implied, of merchantability and fitness for any particular purpose.

The Recipient agrees, as a condition of forwarding the Electronic Form Documents to any other person or entity, to require such third party to agree in writing to the terms and conditions of this Agreement concerning use of the Electronic Form Documents.

Dated this the _____ day of _____ (month), _____ (year).

(Contractor)

By: _____

SECTION 01 31 13 - PROJECT COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural instructions for project coordination, including the following:
 - 1. Vapor emission control.
- B. The Contractor shall use their best skill and attention to coordinate all aspects of the Project and plan the Work in advance of execution so as to achieve each of the following objectives listed below. The Owner is responsible to compensate the Contractor neither for costs nor lost time incurred due to Contractor's failure to meet the objectives required for Project Coordination.
 - 1. The Contractor shall anticipate and thereby prevent circumstances that could necessitate the need for alteration of work following execution.
 - 2. Avoid the need for alteration of existing work not documented in the Contract.
 - 3. Avoid alteration of new work once it has been executed.
 - 4. Expedite progress so as to complete the Work within the Contract Time or in advance of scheduled milestones.
 - 5. Prevent conflicts among the various trades engaged in the Work.
- C. When notified by the Owner's representative the Contractor shall provide for the occurrence of work by other prime contractors at the Project site over the course of the Work. Such work may affect site and building access, utilities and other aspects of the Project. Coordinate the Work, and adapt sequence and staging as necessary to accommodate work by other prime contractors and work by the Owner. Periodically during the course of the Work consult the Owner's representative for information on current projects
 - 1. Owner installation of furniture and equipment.
 - 2. Construction in adjacent facilities.
- D. Submittals: General coordination memoranda, drawings, diagrams and schedules, for the coordinated control and utilization of the site, from beginning of construction activity through project close-out and warranty periods
 - 1. Non-standard conditions report; describe condition, location and suggested remedial measures.
 - 2. Coordination Drawings.
- E. Related Requirements.
 - 1. Section 01 10 00 "Summary."
 - 2. Section 01 32 16 "Construction Progress Schedule."
 - 3. Section 01 60 00 "Product Requirements."
 - 4. Section 01 61 16 "Delegated Design Requirements."
 - 5. Section 01 70 00 "Execution and Closeout Requirements."

6. Section 01 74 19 "Construction Waste Management and Disposal."
7. Section 01 78 00 "Closeout Submittals."
8. Divisions 04 through 14 Sections which include bidder-designed and/ or delegated design Work.
9. Divisions 21 through 28 Sections.

1.3 CONSTRUCTION ORGANIZATION AND START-UP

- A. Establish on-site lines of authority and communications including the following:
 1. Establish procedures of intra-project communications including:
 - a. Submittals.
 - b. Reports and records.
 - c. Recommendations.
 - d. Coordination Drawings.
 - e. Schedules.
 - f. Resolution of conflicts.
 2. Contract Documents Interpretation:
 - a. Consult with Architect to obtain interpretation.
 - b. Assist in resolution of questions or conflicts which may arise.
 - c. Transmit written interpretations to Subcontractors and to other concerned parties.
 3. Permits and Approvals: Verify that subcontractors have obtained required permits and inspections for work and for temporary facilities.
 4. Control Use of Site:
 - a. Supervise field engineering and project layout.
 - b. Allocate field office space and work and storage areas for use of each subcontractor.
 - c. Schedule, coordinate, and facilitate combined efforts of Engineer of Record and mechanical and electrical subcontractors to achieve Design Assist of mechanical and electrical systems.
 - d. Develop a pre-fire protection plan to be maintained on-site and provided to the building or fire code official upon request.

1.4 REQUIREMENTS FOR BIDDER-DESIGNED WORK

- A. Refer to Section 01 61 16 "Delegated Design Requirements."

1.5 COORDINATING SUBCONTRACTORS' WORK

- A. Coordinate the work of all subcontractors and make certain that, where the work of one trade is dependent upon the work of another trade, the work first installed is properly placed, installed, aligned, and finished as specified or required to properly receive subsequent materials applied or attached thereto.
- B. Direct subcontractors to correct defects in substrates they install when subcontractors of subsequent materials have a reasonable and justifiable objection to such surfaces.
- C. Do not force subcontractors to apply or install product to improperly placed or improperly finished substrates that would result in an unsatisfactory or unacceptable finished product.

- D. When the work of a subcontractor is critical to the Project schedule, coordinate the reasonable efforts of that subcontractor to ensure adherence to the schedule, including added labor, materials, equipment, tools, construction, equipment, machinery, or other facilities as necessary to accelerate the construction.
- E. Coordinate the preparation and submission of coordinated layout drawings, prior to construction, to coordinate installation and location of HVAC equipment, ductwork, grilles, diffusers, piping, fire sprinklers, plumbing, lights, and electrical services. Provide composite drawings showing all services on single sheet. Prior to completion of coordination drawings, coordinate proposed installation with architectural and structural requirements, and other trades (including plumbing, fire protection, electrical, ceiling suspension, and tile systems), and comply with maintenance access requirements for all equipment.
- F. Temporary Construction Barricades: Submit attachment methods for review and approval for all temporary construction and fall protection which occurs at exposed concrete or polished concrete.
- G. Perform field survey of location and elevation of all cast-in-place slab edges prior to beginning installation of framing.

1.6 COORDINATING WORK WITH OWNER'S WORK AND OTHER GENERAL CONTRACTOR'S WORK

- A. Coordinate and make certain that where work of either party is dependent upon the other party, the work first performed is properly placed, installed, aligned, and finished as required to permit the proper installation of the following work.
- B. If the other work in any way interferes with the General Contractor's work so notify the other party sufficiently in advance so that the other party has reasonable time to make necessary adjustments.
- C. If the General Contractor's work in any way interferes with the other party's work, so notify the other party as soon as possible. The General Contractor shall modify its schedule as reasonably necessary to accommodate the other party's work.
- D. General Contractor recognizes that Owner is entitled under the Contract Documents, including without limitations GC Article 6, to perform work on site during the course of General Contractor's performance, whether via Owner's forces, consultants, or separate Contractors.

1.7 COORDINATION DRAWINGS

- A. The contractor shall provide for participation by representatives of each of the trades or entities involved in the execution of work to be documented by the coordination drawings, who shall be knowledgeable of all the requirements for the Work and fully authorized to act on behalf of the entity or firm they represent.
 - 1. Provide a highly skilled CAD operator to assist all parties in the development of the coordination drawings, and in the review and understanding of them; including assistance to the OAR, and the Owner's consultants.
 - 2. Drawings shall use color coding, layering and other appropriate conventions to show discretely the components of each system, highlight conflicts, document the resolution of them, and limn the integration of all systems in the building free from conflicts.
 - a. Scale: Comply with Shop Drawing requirements; use the same or larger drawing scale as used in the Contract Documents for the information and level of detail to be conveyed.
 - 3. As necessary to comply with the intent of the coordination effort and when directed the Construction Manager shall require the participation of any lower tier contractor and any

vendor in the coordination effort at no additional cost to the Owner. Without limitation on this requirement the following lower tier contractors may be required to be included.

- a. Plumbing/HVAC wet side, HVAC dry side, Fire Protection, Electrical, telecommunications, security, equipment suppliers and others as necessary to insure proper clearances, penetrations and dimensional coordination for all building systems.
 - b. Glazier, sheet metal trades and others responsible for construction of the exterior building envelope as necessary to ensure integrated, weather-resistant assembly.
4. Coordination meetings shall be held at regularly scheduled intervals appropriate to the status of the Work and sufficiently in advance of execution to avoid the need for modifications to work already in place and prevent any delay in progress.
- B. Coordination of Work Sequence and Quality Assurance and Commissioning Activities: Schedule to provide timely evaluation of the Work and identify defects and deficiencies at the earliest time possible. Facilitate corrective and remedial action to avoid delay in the progress of the Work.
- C. Review drawings prior to submission to Architect.

PART 2 - PRODUCTS

-NOT USED -

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Contractor shall notify Architect of conditions created and uncovered during the Work that may complicate completion of subsequent work. Such conditions include but are not limited to substrate profile, coatings, integrity, voids and protrusions and other conditions. Report non-standard and potentially problematic conditions in writing, and suggest remedial measures.
- B. Contractor: Responsible for knowing the general character of each item of new work to be installed in areas where Work is performed, and understand the standard conditions and substrate characteristics for proper installation of the new work.
 1. Utilize coordination drawings and field verification of dimensions and measurements to ensure mechanical, plumbing, electrical and other building systems and equipment are coordinated with building structure and architectural features. Verify physical dimensions of equipment with the space available and ensure necessary clearances exist for execution, operation and maintenance.
 2. Manufacturer's Instructions: Where new work will include manufactured products, inspect manufacturer's instructions and recommendations for installation. Provide conditions complying with the manufacturer's recommendations.

3.2 VAPOR EMISSION CONTROL

- A. It shall be the responsibility of the Contractor to achieve acceptable substrate conditions at concrete floors (elevated, on-grade and topping slabs, and gyp-crete) throughout the Project conforming to limits established by the Contract Documents for moisture emission and alkalinity measured as pH. The Contractor shall consider all factors of the Work that may affect the acceptability of concrete substrates for finish flooring installation, determine the means, and methods that will effectively control conditions and established the conditions needed within the requirements of the Contract Schedule and provide all means, methods to maintain the Contract

Schedule and prevent delay to flooring installation and the overall progress of the Work at no additional cost to the Owner.

1. Contractor's Vapor Emission Control Plan: Provide a concise summary of all measures to be provided and supplementary corrective measures where acceptable conditions have not been obtained. Plan shall include a schedule that is coordinated with the Contract Schedule and indicate each required step from initial concrete placement through moisture and pH testing and finish floor installation for each type of finish floor required except for areas where Portland cement concrete is the finish floor.
2. In addition to Contractor's means, methods, and schedule for vapor emission control measures the Plan shall provide for coordination of the concreting work with subsequent finish flooring work including but not limited to concrete mix design, placement and cure; finish flooring products and associated vapor emission and pH level requirement; measures to establish a controlled environment where temperature and relative humidity are regulated.

END OF SECTION

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SECTION 01 32 16 - CONSTRUCTION PROGRESS SCHEDULE

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. Preliminary schedule.
 - 2. Construction progress schedule, bar chart type.

1.3 REFERENCES

- A. AGC (CPSM) - Construction Planning and Scheduling Manual; Associated General Contractors of America; 2004.
- B. M-H (CPM) - CPM in Construction Management - Project Management with CPM, O'Brien, McGraw-Hill Book Company; 2006.

1.4 SUBMITTALS

- A. Within 10 days after date of Agreement, submit preliminary schedule defining planned operations for the first 60 days of Work, with a general outline for remainder of Work.
- B. If preliminary schedule requires revision after review, submit revised schedule within 10 days.
- C. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
- D. Within 10 days after joint review, submit complete schedule.
- E. Submit updated schedule with each Application for Payment.

1.5 QUALITY ASSURANCE

- A. Scheduler: Contractor's personnel or specialist Consultant specializing in CPM scheduling with one (1) year minimum experience in scheduling construction work of a complexity comparable to this Project, and having use of computer facilities capable of delivering a detailed graphic printout within 48 hours of request.

1.6 SCHEDULE FORMAT

- A. Listings: In chronological order according to the start date for each activity. Identify each activity with the applicable specification section number.
- B. Sheet Size: Multiples of 8-1/2 x 11 inches.

PART 2 - PRODUCTS

- NOT USED -

PART 3 - EXECUTION

3.1 PRELIMINARY SCHEDULE

- A. Prepare preliminary schedule in the form of a horizontal bar chart.

3.2 CONTENT

- A. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.
- B. Identify each item by specification section number.
- C. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.
- D. Indicate delivery dates for owner-furnished products.
- E. Provide legend for symbols and abbreviations used.

3.3 BAR CHARTS

- A. Include a separate bar for each major portion of Work or operation.
- B. Identify the first work day of each week.

3.4 REVIEW AND EVALUATION OF SCHEDULE

- A. Participate in joint review and evaluation of schedule with Architect at each submittal.
- B. Evaluate project status to determine work behind schedule and work ahead of schedule.
- C. After review, revise as necessary as result of review, and resubmit within 10 days.

3.5 UPDATING SCHEDULE

- A. Maintain schedules to record actual start and finish dates of completed activities.
- B. Indicate progress of each activity to date of revision, with projected completion date of each activity.
- C. Annotate diagrams to graphically depict current status of Work.
- D. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.
- E. Indicate changes required to maintain Date of Substantial Completion.
- F. Submit reports required to support recommended changes.

3.6 DISTRIBUTION OF SCHEDULE

- A. Distribute copies of updated schedules to Contractor's project site file, to Subcontractors, suppliers, Architect, Owner, and other concerned parties.
- B. Instruct recipients to promptly report, in writing, problems anticipated by projections shown in schedules.

END OF SECTION

SECTION 01 33 00 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other miscellaneous submittals.
 - 1. Project is pursuing Earth Advantage Multifamily Gold certification. Coordinate submittal requirements with the Architect to meet program requirements and facilitate certification.
- B. Related Sections include the following:
 - 1. Section 01 31 00 "Project Management and Coordination".
 - 2. Section 01 40 00 "Quality Requirements".
 - 3. Section 01 60 00 "Product Requirements".
 - 4. Section 01 70 00 "Execution and Closeout Requirements".
 - 5. Section 01 78 00 "Closeout Submittals".

1.3 DEFINITIONS

- A. Action Submittals: Written and graphic information that requires Architect's responsive action.
- B. Informational Submittals: Written information that does not require Architect's approval. Submittals may be rejected for not complying with requirements.
- C. Climate Zone: The IECC climate region. The project site resides within Climate Zone 4c.
- D. Energy Code: 2019 Oregon Zero Energy Ready Commercial Code (Chapter 13 of the 2019 Oregon Structural Specialty Code).
 - 1. Project is following an alternative compliance method No. 19-01 from the State of Oregon, enabling the project to follow 2018 International Energy Conservation Code for buildings over 3 stories.
- E. Local Materials: Materials harvested/extracted, manufactured and delivered within 500 miles of the project site.
- F. Low-emitting Materials: Materials and products used at the interior and as indicated at the exterior of the building, to meet Portland Housing Bureau (PHB) Affordable Housing Green Building Policy and Earth Advantage Multifamily Certification standards, as follows:
 - 1. Adhesives, sealants and sealant primers that do not exceed the Volatile Organic Content (VOC) limits defined by the current version of California Section 01350 and South Coast Air Quality Management District (SCAQMD) Rule 1113.
 - a. Additional details regarding Earth Advantage (EA) MFv1 VOC limits:
 - 1) Sealants/Caulking: 50 gpl or less (EAMFv1 measure 7.1.3).
 - 2) Multipurpose Construction Adhesive: 70 gpl or less (EAMFv1 measure 7.1.4).
 - 3) Indoor Carpet & Pad Adhesive: 50 gpl or less (EAMFv1 measure 7.1.5).

- b. Minimum threshold values are required to be met to earn credit with the Earth Advantage (EA) MFv1 certification standard.
 2. Paints and coatings that do not exceed the Volatile Organic Content (VOC) limits defined by the current version of California Section 01350 and South Coast Air Quality Management District (SCAQMD) Rule 1113
 - a. Additional details regarding Earth Advantage (EA) MFv1 VOC limits:
 - 1) Wall and Ceiling Latex Paints: 50 gpl or less (EAMFv1 measure 7.2.2)
 - 2) Trim Paint: 70 gpl or less (EAMFv1 measure 7.2.3)
 - 3) Exterior Paint or Stain: 150 gpl or less (EAMFv1 measure 3.8.1)
 - b. Minimum 90 percent by surface area coverage of material to be met to earn credit with the Earth Advantage (EA) MFv1 certification standard.
- 1.4 PORTLAND HOUSING BUREAU (PHB) AFFORDABLE HOUSING GREEN BUILDING POLICY
 - A. The objective of the Portland Housing Bureau (PHB) Green Building Policy is to ensure that construction funded by PHB advances environmental, social, and economic goals for the following:
 1. Improve tenant health.
 2. Reduce operations and maintenance costs.
 3. Provide equitable access to high-performance buildings.
 4. Maximize public investment benefits.
 5. Protect air, water, and other natural resources.
 6. Implement the Climate Action Plan of the City of Portland and Multnomah County.
 - B. Excerpt: Energy.
 1. Energy Conservation:
 - a. Achieve Net Zero Energy for PHB funded buildings by or before the year 2050. The table below indicates a potential timeline, to be reviewed annually.

YEAR	2017	2020	2025	2030	2035	2040	2045	2050
NET EUI (Site)*:	30	28	23	18	12	8	4	0

- b. In above table, Net EUI (Site) includes efficiency and generation.
 - c. Project is subject to 2017 metrics for this requirement.
- C. Excerpt: Water
 1. Water Conservation
 - a. Achieve a 50 percent reduction in net water consumption for PHB funded buildings by or before the year 2040. The table below indicates a potential timeline, to be reviewed annually.

YEAR	2017	2020	2025	2030	2035	2040
NET Water Consumption Reduction*:	28%	30%	35%	40%	45%	50%

- b. New construction must meet the EPA Act 1992 Reduction for Water Consumption for the residential area, not including irrigation.

- c. This project is subject to 2017 metrics for this requirement.
 - D. Excerpt: Health.
 - 1. Indoor Air Quality / Health:
 - a. Enhance indoor air quality by reducing sources of indoor contaminants and pollutants, and increasing ventilation and fresh air supply.
 - 2. Clean Air:
 - a. Interior Paints, Interior Coatings, Site-applied Sealants, Insulation, and Flooring to meet California Section 01350 Specification or South Coast Air Quality Management District (SCAQMD) 1113.
 - b. Composite Wood Products to meet the California Environmental Protection Agency's Air Resources Board, Air Toxics Control Measure for Composite Wood requirements for ultra-low-emitting formaldehyde (ULEF) resins or no added urea formaldehyde (NAUF) resins.
 - c. Establish a smoke free policy prohibiting smoking and the use of e-cigarettes indoors. Such policy must be submitted to PHB as part of Compliance requirements and must also be incorporated in the project's property management requirements.
 - 3. Ventilation and Fresh Air:
 - a. Supply and exhaust must be balanced in each unit.
 - b. Exhaust from bathrooms and kitchens must exhaust directly to the outdoors. Heat recovery may be included; recirculating exhaust is not acceptable.
 - c. Comply with, at minimum, ASHRAE 62.2-2010.
 - E. Excerpt: Operations.
 - 1. Operations and Maintenance (O&M) Trainings:
 - a. The general contractor and/or design team will provide O&M Trainings with maintenance staff, to be video recorded and the video made available on site with the project manuals.
 - 2. O&M Manual:
 - a. The O&M Manual is to include:
 - 1) A summary of features and benefits related to the sustainable systems employed in the project.
 - 2) Lists of potential service vendors for major systems and equipment and the contact information of the commissioning agent.
 - 3. Tenant Education:
 - a. The design team/general contractor to provide tenant education on the building and unitized systems and tenant controls, to be video recorded and made available on site with the property manager.
 - 4. For a complete list of Portland Housing Bureau (PHB) Green Building Policy requirements go to: <https://www.portlandoregon.gov/citycode/article/667647>.
- 1.5 EARTH ADVANTAGE MULTIFAMILY CERTIFICATION STANDARD REQUIREMENTS
- A. Refer to Earth Advantage MF Project Points Worksheet for measures and requirements.
 - B. Accountability Forms:
 - 1. Erosion Control Accountability Form.

2. Waste Management Plan Accountability Form.
3. Thermal Enclosure Checklist.
4. General Accountability: One (1) per stakeholder (e.g. Owner, Architect, General Contractor, Mechanical, Landscape Architect, Civil).
5. Earth Advantage MF Measures Resource Guide.
6. Earth Advantage MF Testing Standards:
 - a. ANSI/RESNET/ICC 380-2019 Standard for Testing Air-tightness of Building Enclosures, and Air-tightness of Heating and Cooling Air Distribution.
7. Earth Advantage Milestone of Inspections.
8. Earth Advantage Process Flow Chart.

1.6 SUBMITTAL PROCEDURES

- A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- B. Submittals Schedule: Comply with requirements in Section 01 32 00 - Construction Progress Documentation for list of submittals and time requirements for scheduled performance of related construction activities.
- C. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal.
 1. Initial Review: Allow 10 working days for initial review of each submittal. Allow additional time if processing must be delayed to permit coordination with subsequent submittals. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
 2. If intermediate submittal is necessary, process it in same manner as initial submittal.
 3. Allow 10 days for processing each re-submittal.
 4. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing.
- D. Identification: Place a permanent label or title block on each submittal for identification.
 1. Indicate name of firm or entity that prepared each submittal on label or title block.
 2. Provide a space approximately 4 by 5 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
 3. Include the following information on label for processing and recording action taken:
 - a. Project name.
 - b. Date.
 - c. Name and address of Architect.
 - d. Name and address of Contractor.

- e. Name and address of subcontractor.
 - f. Name and address of supplier.
 - g. Name of manufacturer.
 - h. Number and title of appropriate Specification Section.
 - i. Other necessary identification.
- E. Deviations: Highlight, encircle, or otherwise identify deviations from the Contract Documents on submittals.
- F. Additional Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions of the Contract Documents, initial submittal may serve as final submittal.
 - 1. Architect to transmit copy to concurrent reviewer.
 - 2. Additional copies submitted for maintenance manuals will not be marked with action taken and will be returned.
- G. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will return submittals, without review, received from sources other than Contractor.
 - 1. Include Contractor's certification stating that information submitted complies with requirements of the Contract Documents.
 - 2. Transmittal Form: Provide locations on form for the following information:
 - a. Project name.
 - b. Date.
 - c. Destination (To:).
 - d. Source (From:).
 - e. Submittal purpose and description.
 - f. Remarks.
 - g. Signature of transmitter.
- H. 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.
- I. Use for Construction: Use only final submittals with mark indicating action taken by Architect in connection with construction.

PART 2 - PRODUCTS

2.1 SUBMITTALS

- A. General: Prepare and submit Action Submittals required by individual Specification Sections.
 - 1. Number of Copies: Submit a minimum of three (3) copies of each submittal plus the number of copies needed for distribution by the Contractor, unless otherwise indicated. Architect will return all copies in excess of three (3).
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
 - 1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.

2. Mark each copy of each submittal to show which products and options are applicable.
 3. Include the following information, as applicable:
 - a. Manufacturer's written recommendations.
 - b. Manufacturer's product specifications.
 - c. Standard color charts.
 - d. Manufacturer's catalog cuts.
 - e. Printed performance curves.
 - f. Operational range diagrams.
 - g. Mill reports.
 - h. Compliance with recognized testing agency standards.
 - i. Application of testing agency labels and seals.
 - j. Notation of coordination requirements.
 4. Acoustical Performance Data: The specified acoustical and noise control products represent a minimum level of quality and performance. Where acoustical ratings are scheduled and submittals are requested, submit detailed performance specifications and independent acoustical laboratory test reports.
- 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: Include the following information, as applicable:
 - a. Dimensions.
 - b. Identification of products.
 - c. Fabrication and installation drawings.
 - d. Roughing-in and setting diagrams.
 - e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
 - f. Templates and patterns.
 - g. Schedules.
 - h. Design calculations.
 - i. Compliance with specified standards.
 - j. Notation of coordination requirements.
 - k. Notation of dimensions established by field measurement.
 2. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.
 3. 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 40 inches.
 4. Number of Copies: Submit a minimum of three (3) copies of each submittal plus the number of copies needed for distribution by the Contractor, unless otherwise indicated. Architect will return all copies in excess of three (3).
- D. Coordination Drawings: Comply with requirements in Section 01 31 13 "Project Coordination.
- E. Samples: Prepare physical units of materials or products, including the following:
1. Comply with requirements in Section 01 40 00 "Quality Requirements" for mockups.

2. 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.
3. Preparation: Mount, display, or package Samples in manner specified to facilitate review of qualities indicated. Prepare Samples to match Architect's sample where so indicated. Attach label on unexposed side that includes the following:
 - a. Generic description of Sample.
 - b. Product name or name of manufacturer.
 - c. Sample source.
4. Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, provide the following:
 - a. Size limitations.
 - b. Compliance with recognized standards.
 - c. Availability.
 - d. Delivery time.
5. Submit Samples for review of kind, color, pattern, and texture for a final check of these characteristics with other elements and for a comparison of these characteristics between final submittal and actual component as delivered and installed.
 - a. If variation in color, pattern, texture, or other characteristic is inherent in the product represented by a Sample, submit at least three sets of paired units that show approximate limits of the variations.
 - b. Refer to individual Specification Sections for requirements for Samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation, and similar construction characteristics.
6. Number of Samples for Initial Selection: 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.
7. 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 not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
- F. Photographic Evidence: Submit 4 copies of Photographic evidence of Mock-up showing item/assembly from all necessary angles to allow review of this item.
- G. Application for Payment: Comply with requirements in Section 01 20 00 "Price and Payment Procedures".
- H. Coordination of Submittals:
 1. Shop drawing review coordination: Submit the following shop drawings at the same time:
 - a. Section 07 42 13 "Formed Metal Wall Panels."
 - b. Section 07 62 00 "Sheet Metal Flashing and Trim."
 - c. Section 08 43 13 "Aluminum Framed Entrances and Storefronts."

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

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

3.2 ARCHITECT'S ACTION

- A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.
- B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will indicate on the cover of the returned submittal which of the following possible actions are being taken:
 - 1. NO EXCEPTIONS TAKEN
 - 2. MAKE CORRECTIONS NOTED
 - 3. REVISE AND RESUBMIT
 - 4. REJECTED

END OF SECTION

SECTION 01 40 00 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Quality assurance submittals.
 - 2. Mock-ups.
 - 3. Pre-installation meetings.
 - 4. Control of installation.
 - 5. Tolerances.
 - 6. Testing and inspection services.
 - 7. Manufacturers' field services.
- B. Related Requirements:
 - 1. Section 01 30 00 "Administrative Requirements" for submittal procedures.
 - 2. Section 01 42 19 "Reference Standards."
 - 3. Section 01 60 00 "Product Requirements" for requirements for material and product quality.

1.3 CONFLICTING REQUIREMENTS

- A. Conflicting Standards and Other Requirements: If compliance with two or more standards or requirements are specified or indicated, and the standards or requirements 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 direction before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.4 SUBMITTALS

- A. Mockup Shop Drawings: For integrated exterior mockups.
 - 1. Include plans, sections, elevations, and details, indicating materials and size of mockup construction.
 - 2. Indicate manufacturer and model number of individual components.
 - 3. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.
- B. Testing Agency Qualifications:
 - 1. Submit documentation to demonstrate capabilities and experience for testing agencies specified in "Quality Assurance" Article. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

- C. Design Data: Submit for Architect's knowledge as contract administrator for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents, or for Owner's information.
- D. Delegated Design: Refer to Section 01 61 16 "Delegated Design Requirements".
- E. Test Reports: After each test/inspection, promptly submit two copies of report to Architect and to Contractor.
- F. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect, in quantities specified for Product Data.
 - 1. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
 - 2. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect.
- G. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.
- H. Manufacturer's Field Reports: Submit reports for Architect's benefit as contract administrator or for Owner.
 - 1. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.
- I. Erection Drawings: Submit drawings for Architect's benefit as contract administrator or for Owner.
 - 1. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

1.5 REFERENCES AND STANDARDS

- A. See Section 01 42 19 "Reference Standards."

1.1 QUALITY ASSURANCE

- A. 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. As applicable, procure products from manufacturers able to meet qualification requirements, warranty requirements, and technical or factory-authorized service representative requirements.
- 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, applying, 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 is 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 in the activities indicated.
 - 1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.
- G. Testing and Inspecting Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspection indicated, as documented in accordance with ASTM E329, and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
- H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect, demonstrate, repair, and perform service on installations of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- J. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following Contractor's responsibilities, including the following:
 - 1. Provide test specimens representative of proposed products and construction.
 - 2. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
 - 3. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
 - 4. Build site-assembled test assemblies and mockups, using installers who will perform same tasks for Project.
 - 5. Build laboratory mockups at testing facility, using personnel, products, and methods of construction indicated for the completed Work.
 - 6. When testing is complete, remove test specimens and test assemblies, and mockups; do not reuse products on Project.
 - 7. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect and Commissioning Authority, through Construction Manager, with copy to Contractor. Interpret tests and inspections, and state in each report whether tested and inspected Work complies with or deviates from the Contract Documents.
- K. 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 of size indicated.
 - 2. Build mockups in location indicated or, if not indicated, as directed by Architect or Construction Manager.

3. Notify Architect and Construction Manager seven (7) days in advance of dates and times when mockups will be constructed.
 4. Employ supervisory personnel who will oversee mockup construction. Employ workers who will be employed to perform same tasks during the construction at Project.
 5. Demonstrate the proposed range of aesthetic effects and workmanship.
 6. Obtain Architect's and Construction Manager's approval of mockups before starting corresponding Work, fabrication, or construction.
 - a. Allow seven (7) days for initial review and each re-review of each mockup.
 7. Promptly correct unsatisfactory conditions noted by Architect's preliminary review, to the satisfaction of the Architect, before completion of final mockup.
 8. Approval of mockups by the Architect does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 9. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 10. Demolish and remove mockups when directed unless otherwise indicated.
- L. Integrated Exterior Mockups: Construct integrated exterior mockup as indicated on Drawings. Coordinate installation of exterior envelope materials and products for which mockups are required in individual Specification Sections, along with supporting materials. Comply with requirements in "Mockups" Paragraph.
1. Coordinate construction of the mockup to allow observation of air barrier installation, flashings, air barrier integration with fenestration systems, and other portions of the building air/moisture barrier and drainage assemblies, prior to installation of veneer, cladding elements, and other components that will obscure the work.
- 1.2 TESTING AND INSPECTION AGENCIES
- A. Owner will employ services of an independent testing agency to perform specified testing. Owner shall contract and pay for testing services from an independent agency to perform testing specified.
 - B. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

PART 2 - PRODUCTS

- NOT USED -

PART 3 - EXECUTION

3.1 PRE-INSTALLATION MEETING

- A. Contractor shall schedule pre-installation meeting for products where requirements are indicated.
- B. Attendance Required:
 1. Owner's Representative.
 2. Architect.
 3. Contractor.
 4. Subcontractor.

- C. Agenda:
 - 1. Review existing and as-built conditions.
 - 2. Review installation procedures.
 - 3. Confirm coordination requirements
- D. Contractor shall record minutes and distribute copies within two days after meeting to participants, with two copies to Owner, Architect, other meeting participants, and those affected by decisions made.

3.2 PREPARATION

- A. General: Before starting each portion of the Work, carefully review the Construction Documents pertaining to that portion of the Work, take field measurements of any existing conditions effecting the Work, and observe any other conditions at the site affecting the Work. The review of documents, of existing and site conditions is to facilitate coordination. Any errors, inconsistencies or omissions discovered by or made known as a request for information, and in review of conditions and Contract Documents, shall be reported to the Architect for clarification. Proceeding with Work without clarification of known discrepancies shall be at the sole cost and responsibility of the Contractor where additional work is required.

3.3 CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.
- B. Comply with manufacturers' instructions, including each step in sequence.
- C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.
- D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Have Work performed by persons qualified to produce required and specified quality.
- F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
- G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.4 MOCK-UPS

- A. Tests will be performed under provisions identified in this section and identified in the respective product specification sections.
- B. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.
- C. Accepted mock-ups shall be a comparison standard for the remaining Work.
- D. Where mock-up has been accepted by Architect and is specified in product specification sections to be removed, remove mock-up and clear area when directed to do so.

3.5 TOLERANCES

- A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

- B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect before proceeding.
- C. Adjust products to appropriate dimensions; position before securing products in place.

3.6 COORDINATION OF COMPATIBILITY

- A. Compatibility Letter and Chart: In order to ensure the compatibility of various interfaced products in the Project, it shall be the responsibility of the General Contractor to coordinate the provision of the following submittals:
 - 1. Provision by the subcontractors of compatibility letters certifying physical and chemical compatibility of products in this section with all other dampproofing, waterproofing, weather barrier, roofing, self-adhered flashing and sealant products in the Project. Coordinate with the following Sections:
 - a. Section 07 11 13 "Bituminous Dampproofing."
 - b. Section 07 17 00 "Bentonite Waterproofing".
 - c. Section 07 25 00 "Weather Barriers".
 - d. Section 07 62 00 "Sheet Metal Flashing and Trim."
 - e. Section 07 92 00 "Joint Sealants."
 - 2. Compatibility Chart to be compiled by the General Contractor based on input from the subcontractors providing Compatibility Letters. Compatibility Chart shall indicate:
 - a. All dampproofing, waterproofing, weather barrier, roofing, self-adhered flashing and sealant products.
 - b. Which other products all the products interface (are in contact with) in the Project.
 - c. The physical compatibility between those interfaced products.
 - d. The chemical compatibility between those interfaced products.
- B. Review compatibility letter and chart during preinstallation conferences.

3.7 TESTING AND INSPECTION

- A. Testing Agency Duties:
 - 1. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
 - 2. Perform specified sampling and testing of products in accordance with specified standards.
 - 3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
 - 4. Promptly notify Architect and Contractor of observed irregularities or non-conformance of Work or products.
 - 5. Perform additional tests and inspections required by Architect.
 - 6. Submit reports of all tests/inspections specified.
- B. Limits on Testing/Inspection Agency Authority:
 - 1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
 - 2. Agency may not approve or accept any portion of the Work.
 - 3. Agency may not assume any duties of Contractor.
 - 4. Agency has no authority to stop the Work.
- C. Contractor Responsibilities:

1. Deliver to agency at designated location, adequate samples of materials proposed to be used which require testing, along with proposed mix designs.
 2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
 3. Provide incidental labor and facilities:
 - a. To provide access to Work to be tested/inspected.
 - b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
 - c. To facilitate tests/inspections.
 - d. To provide storage and curing of test samples.
 4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
 5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
 6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
- D. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by Architect.
- E. Re-testing required because of non-conformance to specified requirements shall be paid for by Contractor.
- F. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by Architect. Payment for retesting will be charged to the Contractor by deducting testing charges from the Contract Price.

3.8 MANUFACTURERS' FIELD SERVICES

- A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment as applicable, and to initiate instructions when necessary.
- B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

3.9 DEFECT ASSESSMENT

- A. Replace Work or portions of the Work not conforming to specified requirements.
- B. If, in the opinion of Architect, it is not practical to remove and replace the Work, Architect will direct an appropriate remedy.

END OF SECTION

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SECTION 01 42 19 - REFERENCE STANDARDS

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 referenced standards.

1.3 QUALITY ASSURANCE

- A. For products or workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Should specified reference standards conflict with Contract Documents, request clarification from the Architect before proceeding.
- C. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of the Architect shall be altered by the Contract Documents by mention or inference otherwise in any reference document.

1.4 ORGANIZATION AND AGENCY ABBREVIATIONS AND ACRONYMS

- A. Refer to specification sections for applicable abbreviations and acronyms for industry organizations and federal, state and local agency requirements, standards and regulatory organizations.
- B. Construction Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."
- C. United States Government and Related Agencies Abbreviations: Where occurs; see individual sections.

PART 2 - PRODUCTS

- NOT USED -

PART 3 - EXECUTION

- NOT USED -

END OF SECTION

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SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Temporary telephone service.
 - 2. Temporary sanitary facilities.
 - 3. Temporary Controls: Barriers, enclosures, and fencing.
 - 4. Security requirements.
 - 5. Vehicular access and parking.
 - 6. Waste removal facilities and services.
 - 7. Project identification sign.
 - 8. Field offices.

1.3 COMMUNICATIONS SERVICES

- A. Provide, maintain and pay for cellular and land-line telephone services, internet service and facsimile service to field office at time of project mobilization.

1.4 TEMPORARY SANITARY FACILITIES

- A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.
- B. Maintain daily in clean and sanitary condition.

1.5 BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations.
- B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.
- C. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.6 FENCING

- A. Provide 6 foot high fence around construction site; equip with vehicular and pedestrian gates with locks.

1.7 EXTERIOR ENCLOSURES

- A. Provide temporary insulated weather tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

- B. Provide temporary weather tight enclosures for site storage of weather-sensitive products and items. Enclosures shall accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access openings with locks.

1.8 SECURITY

- A. Provide security and facilities to protect Work, existing facilities, and Owner's operations from unauthorized entry, vandalism, or theft. Scope of required security measures to be determined by Owner and Contractor during bidding.

1.9 VEHICULAR ACCESS AND PARKING

- A. Coordinate access and haul routes with governing authorities and Owner.
- B. Provide and maintain access to fire hydrants, free of obstructions.
- C. Provide means of removing mud from vehicle wheels before entering streets.
- D. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.

1.10 WASTE REMOVAL

- A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.
- B. Provide containers with lids. Remove trash from site periodically.
- C. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.
- D. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.11 PROJECT SIGNAGE

- A. Provide two (2) project identification signs of 3/4-inch thickness MDO plywood with black lettering on a white painted field surrounded by a 2-inch black border, based on the following example. Provide two (2) 4 x 4 nominal PT posts set in concrete. Sign shall be 4 feet x 8 feet, with the bottom of the sign 2 feet clear from the ground, minimum. Utilize imagery for project image and logos as provided by the Architect.
- B. Erect on site at locations indicated.
- C. No other signs are allowed without Owner permission except those required by law.

<div>[OWNER LOGO]</div> <div>[PARTNER LOGO]</div> <div>[PARTNER LOGO]</div> <div>[ARCH LOGO]</div> <div>[GC LOGO]</div> <div>[PM LOGO]</div> <div>[PROJECT IMAGE]</div>			<div>[PROJECT NAME] [CONSTRUCTION SITE ADDRESS]</div> <table><tr><td>OWNER</td><td>[OWNER NAME] [CITY, STATE]</td></tr><tr><td>ARCHITECT</td><td>[ARCHITECT NAME] [CITY, STATE]</td></tr><tr><td>STRUCTURAL ENGINEER</td><td>[STRUCTURAL ENGINEER NAME] [CITY, STATE]</td></tr><tr><td>MECHANICAL ENGINEER</td><td>[MECHANICAL ENGINEER NAME] [CITY, STATE]</td></tr><tr><td>PLUMBING ENGINEER</td><td>[PLUMBING ENGINEER NAME] [CITY, STATE]</td></tr><tr><td>ELECTRICAL ENGINEER</td><td>[ELECTRICAL ENGINEER NAME] [CITY, STATE]</td></tr><tr><td>CIVIL ENGINEER</td><td>[CIVIL ENGINEER NAME] [CITY, STATE]</td></tr><tr><td>LANDSCAPE ARCHITECT</td><td>[LANDSCAPE ARCHITECT NAME] [CITY, STATE]</td></tr><tr><td>GENERAL CONTRACTOR</td><td>[GENERAL CONTRACTOR NAME] [CITY, STATE]</td></tr><tr><td>PROJECT MANAGEMENT</td><td>[PROJECT MANAGER NAME] [CITY, STATE]</td></tr></table>	OWNER	[OWNER NAME] [CITY, STATE]	ARCHITECT	[ARCHITECT NAME] [CITY, STATE]	STRUCTURAL ENGINEER	[STRUCTURAL ENGINEER NAME] [CITY, STATE]	MECHANICAL ENGINEER	[MECHANICAL ENGINEER NAME] [CITY, STATE]	PLUMBING ENGINEER	[PLUMBING ENGINEER NAME] [CITY, STATE]	ELECTRICAL ENGINEER	[ELECTRICAL ENGINEER NAME] [CITY, STATE]	CIVIL ENGINEER	[CIVIL ENGINEER NAME] [CITY, STATE]	LANDSCAPE ARCHITECT	[LANDSCAPE ARCHITECT NAME] [CITY, STATE]	GENERAL CONTRACTOR	[GENERAL CONTRACTOR NAME] [CITY, STATE]	PROJECT MANAGEMENT	[PROJECT MANAGER NAME] [CITY, STATE]
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PROJECT MANAGEMENT	[PROJECT MANAGER NAME] [CITY, STATE]																						

1.12 FIELD OFFICES

- A. Office: Weathertight, with lighting, electrical outlets, heating, cooling equipment, and equipped with sturdy furniture, drawing rack and drawing display table.
- B. Provide space for Project meetings, with table and chairs to accommodate 6 persons.
- C. Locate Field Offices a within or nearby the Project site.

PART 2 - PRODUCTS

- NOT USED -

PART 3 - EXECUTION

- NOT USED -

END OF SECTION

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SECTION 01 57 22 - CONSTRUCTION INDOOR AIR QUALITY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section describes Construction Indoor Air Quality (IAQ) goals and includes administrative and procedural requirements for the development and execution of a construction air quality management plan.
- B. Related Requirements:
 - 1. Section 01 33 00 "Submittal Procedures" for required submittal procedures.
 - 2. Section 01 50 00 "Temporary Facilities and Controls" requirements for installation, maintenance and removal of temporary utilities, controls, and facilities during construction.
 - 3. Section 01 60 00 "Product Requirements" procedures for storage of interior materials to prevent exposure to moisture and pollutants.
 - 4. Division 23 "HVAC" sections for duct cleaning procedures.

1.3 INDOOR AIR QUALITY MANAGEMENT

- A. The Owner has established that the contractor shall prevent indoor air quality problems resulting from the construction process, to sustain long term installer and occupant health and comfort.
- B. Protect the ventilation system components during construction and clean contaminated components after construction is complete.
- C. Control sources of potential IAQ pollutants by controlling selection of materials and processes used in project construction.
- D. Meet requirements of Earth Advantage Measure 11.1.5 - Pre-Occupancy Flush.

1.4 SUBMITTALS

- A. IAQ Management Plan for the construction and pre-occupancy phases of the project.
- B. Photographs documenting construction IAQ management measures implemented during construction such as duct protection measures and measures to protect on-site stored or installed absorptive materials from moisture.
- C. Cut sheets of filtration media used during construction with MERV values highlighted.

1.5 CONSTRUCTION AIR QUALITY MANAGEMENT PLAN

- A. Develop a Draft Indoor Air Quality (IAQ) Management Plan for the construction and pre-occupancy phases of the building as follows:
 - 1. During construction meet or exceed the minimum requirements of the Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guidelines for Occupied Buildings under Construction, 2nd edition 2007, ANSI/SMACNA 008-2008 (Chapter 3).
 - 2. Protect stored on-site or installed absorptive materials from moisture damage.
- B. The SMACNA IAQ Guidelines for Occupied Buildings under Construction provides an overview of air pollution associated with construction, control measures, construction process

management, quality control, communicating with occupants, and case studies. These guidelines can be accessed at www.smacna.org. Chapter 3 of the SMACNA Guidelines recommends Control Measures in five areas: HVAC protection, source control, pathway interruption, housekeeping, and scheduling. Review the applicability of each Control Measure and include those that apply in the Draft IAQ Management Plan.

1. HVAC Protection: Shut down the return side of the HVAC system whenever possible during heavy construction. If the system must remain operational during construction include the following strategies that apply:
 - a. Fit the return side of the HVAC system with temporary filters with a Minimum Efficiency Reporting Value (MERV) of 8.
 - b. Isolate the return side of the HVAC system from the surrounding environment as much as possible (e.g., place all tiles for the ceiling plenum, repair all ducts and air handler leaks).
 - c. Damper off the return system in the heaviest work areas and seal the return system openings with plastic.
 - d. Upgrade the filter efficiency where major loading is expected to affect operating HVAC system.
 - e. Clean permanent return air ductwork per National Air Duct Cleaning Association standards upon completion of all construction and finish installation work.
 - f. Replace all filtration media prior to occupancy.
2. Source Control: Propose the substitution of non-toxic formulations of materials that are generally the responsibility of the contractor such as caulks, sealants, and cleaning products.
3. Pathway Interruption: Prevent contamination of clean spaces. Include the following strategies that apply:
 - a. Use 100 percent outside air ventilation (when outside temperatures are between 55 deg F and 85 deg F and humidity is between 30 percent and 60 percent) with air exhausted directly to the outside during installation of finishes and other VOC emitting materials.
 - b. Erect some type of barrier between work areas or between the inside and outside of the building to prevent unwanted airflow from dirty to clean areas.
4. Housekeeping: Reduce construction contamination in the building prior to occupancy through HVAC and regular space cleaning activities.
 - a. Store building materials in a weather tight, clean area prior to unpacking for installation.
 - b. Check for possible damage to building materials from high humidity.
 - c. Clean all coils, air filters, and fans before testing and balancing procedures are performed.
5. Scheduling: Specify construction sequencing to reduce absorption of VOC's by materials that act as sinks or contaminant sources. Complete application of wet and odor-emitting materials such as paints, sealants, and coatings before installing sink materials such as ceiling tiles, carpets, insulation, gypsum products, and fabric-covered furnishings are installed.
 - a. Protect stored on-site or installed absorptive materials from exposure to moisture through precipitation, plumbing leaks, or condensation from the HVAC system to prevent microbial contamination.

- C. Draft IAQ Management Plan Review Meeting: Once the Owner and Architect have reviewed the Draft IAQ Management Plan and prior to construction at the site, schedule and conduct a meeting to review the Draft IAQ Management Plan and discuss procedures, schedules and specific requirements for IAQ during the construction and pre-construction phases of the building. Discuss coordination and interface between the Contractor and other construction activities. Identify and resolve problems with compliance to the requirements. Record minutes of the meeting, identify all conclusions reached and matters requiring further resolution.
 - 1. Attendees: The Contractor and related Contractor personnel associated with the work of this section, including personnel to be in charge of the IAQ management program, Architect, Owner and such additional personnel as the Architect or Owner deem appropriate.
- D. Final IAQ Management Plan: Make any revisions to the Draft IAQ Management Plan agreed upon during the meeting identified in item (C) above and incorporate resolutions agreed to be made subsequent to the meeting. Submit the revised plan to the Owner and Architect for approval within 10 calendar days of the meeting.

PART 2 - PRODUCTS

- NOT USED -

PART 3 - EXECUTION

3.1 IMPLEMENTATION OF IAQ MANAGEMENT PLAN

- A. Manager: The Contractor shall designate an on-site party (or parties) responsible for instructing workers and overseeing and the IAQ Management Plan for the Project.
- B. Progress Meetings: Construction related IAQ procedures shall be included in the pre-construction and construction progress meeting agendas.
- C. Distribution: The Contractor shall distribute copies of the IAQ Management Plan to the Job Site Foreman, each Subcontractor, the Owner, and the Architect.
- D. Instruction: The Contractor shall provide on-site instruction of the IAQ procedures and ensure that all participants in the construction process understand the importance of the goals of the IAQ Management Plan.

END OF SECTION

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SECTION 01 60 00 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. General product requirements.
 - 2. Transportation, handling, storage and protection.
 - 3. Product option requirements.
 - 4. Procedures for Owner-supplied products.
 - 5. Spare parts and maintenance materials.
- B. Related Requirements:
 - 1. Section 01 25 00 "Product Substitution Procedures".
 - 2. Section 01 40 00 "Quality Requirements" for Product quality monitoring.

1.3 SUBMITTALS

- A. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- B. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- C. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
 - 1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

1.4 TRANSPORTATION AND HANDLING

- A. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.
- B. Transport and handle products in accordance with manufacturer's instructions.
- C. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.
- D. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.
- E. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.
- F. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

1.5 STORAGE AND PROTECTION

- A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication.
- B. Store and protect products in accordance with manufacturers' instructions.
- C. Store with seals and labels intact and legible.
- D. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.
- E. For exterior storage of fabricated products, place on sloped supports above ground.
- F. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- G. Prevent contact with material that may cause corrosion, discoloration, or staining.
- H. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- I. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

PART 2 - PRODUCTS

2.1 NEW PRODUCTS

- A. Provide new products unless specifically required or permitted by the Contract Documents.
- B. Basis-of-Design Product Specification Submittal: Show compliance with requirements.
 - 1. The named Basis-of-Design Product's performance criteria, product properties and attributes, including materials and methods used in fabrication of and/or the manufacturing process of individual components or for entire system, as indicated in manufacturers' current published product literature at the date of the Contract Documents, shall establish the minimum performance requirement for the Project, regardless of inclusion in the specification.
- C. Do not use products having any of the following characteristics:
 - 1. Made using or containing CFC's or HCFC's.
 - 2. Made of wood from newly cut old growth timber.
- D. Where all other criteria are met, Contractor shall give preference to products that:
 - 1. Result in less construction waste.
 - 2. Have higher percentage of recycled content.
 - 3. Are manufactured and/or extracted from within 500 miles of jobsite.
 - 4. Wood that is sustainably harvested.
- E. Products with Recycled Content:
 - 1. Specific Product Categories: Provide recycled content as specified elsewhere.
 - 2. Calculations: Where information about recycled content is required to be submitted:
 - a. Determine percentage of post-consumer and post-industrial content separately, using the guidelines contained in 16 CFR 260.7(e).
 - b. Previously used, reused, refurbished, and salvaged products are not considered recycled.

- c. Wood fabricated from timber abandoned in transit to original mill is considered reused, not recycled.
- d. Determine percentage of recycled content of any item by dividing the weight of recycled content in the item by the total weight of all material in the item.
- e. Determine value of recycled content of each item separately, by multiplying the content percentage by the value of the item.

F. Sustainably Harvested Wood:

- 1. Definition: Wood-based materials include but are not limited to floor deck, wood panels, dimension lumber, flooring, wood doors, finishes, and furnishings that are permanently installed in the project. Wood and wood-based products not permanently installed in the project are not included in the definition.

2.2 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.
- B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.
- C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

2.3 SPARE PARTS AND MAINTENANCE PRODUCTS

- A. Provide spare parts, maintenance, and extra products of types and in quantities specified in individual specification sections.
- B. Deliver to Project site; obtain receipt prior to final payment.

2.4 SUBSTITUTION PROCEDURES

- A. Refer to Section 01 25 00 "Product Substitution Procedures."

PART 3 - EXECUTION

- NOT USED -

END OF SECTION

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SECTION 01 61 16 - DELEGATED DESIGN REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. General: This Section specifies administrative and procedural requirements for delegated design indicated in the various Sections of these Specifications.
- B. Section Includes: Structural and other design requirements for delegated design components, otherwise known as fabricator-designed, bidder-designed or bidder design-build components.
- C. This Section applies to Technical Specification Sections, and supplements requirements indicated in the General and Supplementary Conditions.
- D. Delegated design does not mean deferred submittal. See Drawings for deferred submittals.
- E. Related Requirements: Refer to sections indicated for specific delegated design requirements, including, but not limited to the following:
 - 1. Section 03 38 00 "Post-Tensioned Concrete".
 - 2. Section 05 40 00 "Cold-Formed Metal Framing".
 - 3. Section 05 50 00 "Metal Fabrications".
 - 4. Section 05 52 13 "Pipe and Tube Railings".
 - 5. Section 05 73 00 "Decorative Metal Stairs and Railings".
 - 6. Section 07 42 13 "Formed Metal Wall Panels".
 - 7. Section 07 72 00 "Roof Accessories".
 - 8. Section 08 32 13 "Sliding Aluminum-Framed Glass Doors".
 - 9. Section 08 36 13 "Overhead Sectional Doors".
 - 10. Section 08 41 13 "Aluminum-Framed Entrances and Storefronts".
 - 11. Section 08 91 00 "Louvers".
 - 12. Section 09 21 16 "Gypsum Board Shaft Wall Assemblies".
 - 13. Section 09 22 16 "Non-Structural Metal Framing".
 - 14. Section 09 54 26 "Linear Wood Ceilings".
 - 15. Section 14 24 00 "Hydraulic Elevators".
 - 16. Section 28 05 10 "Design-Build Access Control".
- F. Related Requirements: Refer to sections indicated for specific bidder-design requirements:
 - 1. Section 07 84 13 "Penetration Firestopping".

1.2 DEFINITIONS

- A. Contractor Design Requirements: Where occurs, same meaning as Delegated Design Requirements.
- B. Delegated Design Work: Design services and certifications provided by a Professional Engineer registered as such in the State where the Project is located related to systems, materials or equipment required for the Work to satisfy design and performance criteria established by the Contract Documents. Delegated Design does not include professional services the Contractor needs to fulfill their responsibilities under the Contract including but not limited to construction means, methods and sequence.

- C. Seal: Certification that builder design plans, computations and specifications were designed and prepared under the direct supervision of the Architect or Engineer whose name appears thereon.
- D. Approval Stamp: Certification obtained by the Contractor that the Building Official has reviewed a submittal, and finds it acceptable with respect to applicable regulatory requirements.
- E. Bidder-Design: Design services provided by an installer or manufacturer complying with quality assurance, performance requirements and design requirements indicated and established by the Contract Documents. Bidder-design does not include Professional Engineering unless indicated otherwise.

1.3 DELEGATED- AND BIDDER-DESIGN SERVICES

- A. Where referenced in these specifications, Delegated Design components and their attachments to the structure shall comply with the currently adopted edition of all applicable state and local ordinances, with parameters as specified in this individual sections.
- B. Where referenced in these specifications, Bidder-Design components and installation shall comply with the currently adopted edition of all applicable state and local ordinances, with parameters specified in this and individual sections.
- C. Permitting Agency Requirements: Follow the requirements for permits current at the time of submission. The General Contractor is responsible to coordinate and submit all material required, so the permitting agency's review will not adversely affect the construction schedule. At or near time of application, the General Contractor shall meet with the permitting agency to identify Delegated Design components and how they are to be submitted and processed for permits.
- D. 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.

1.4 SUBMITTALS

- A. General: Submit complete Delegated Design Submittals to meet permitting agency requirements for permits. Include drawings and calculations for that portion of the Work signed and sealed by a State of Oregon registered engineer. Incomplete submittals or submittals not previously reviewed and so stamped by General Contractor will not be accepted for review by the Architect or Engineer of Record.
- B. These submittal requirements are in addition to other submittal requirements stated elsewhere in the contract documents.

1.5 QUALITY ASSURANCE

- A. Where referenced in these specifications, Delegated Design components and their attachments to the structure shall comply with the currently adopted edition of all applicable state and local ordinances, with parameters as specified in this section.
- B. Permitting Agency Requirements: Follow the requirements for permits current at the time of submission. The General Contractor is responsible to coordinate and submit all material required, so the permitting agency's review will not adversely affect the construction schedule. At or near time of application, the General Contractor shall meet with the permitting agency to identify Delegated Design components and how they are to be submitted and processed for permits.

1.6 INSURANCES

- A. Refer to General Conditions for Insurance and Bonds.

PART 2 - PRODUCTS

- NOT USED -

PART 3 - EXECUTION

3.1 WORK INCLUDED

- A. General: Certain of the components of the Work under this project are Delegated Design. It is the General Contractor's responsibility to coordinate and assume or assign to subcontractors the complete responsibility for the design, calculations, submittals, fabrication, transportation and installation of the Delegated Design portions or components as required in this Section.
- B. The General Contractor is responsible to submit all documents required by the permitting agency for the separate approval and permit for each Delegated Design item. Delegated Design components of this Work are defined as complete, operational systems, provided for their intended use.
- C. All permit plan review and permit fees for Delegated Design items are the responsibility of the submitting General Contractor.

3.2 DOCUMENTS REQUIRED

- A. General: Delegated Design documents and related permits issuance must be completed prior to fabrication. The General Contractor must complete and submit a Contractor Design Summary Sheet listing Delegated Design Subcontractors and their registered engineer's names and phone numbers prior to submission of the Delegated Design documents for review.
- B. Scope of Documents: Delegated Design components are shown in the Contract Documents for design intent. The purpose is to have the General Contractor responsible to provide, coordinate and install each Delegated Design component.
 - 1. Delegated Design components attached to the structural frame or supplemental to the structural frame shall be designed for the anticipated loads as outlined in the Contract Documents. These Delegated Design components are all to be coordinated with appropriate subcontractors.
 - 2. Load reactions at the interface between the Delegated Design components and the structural frame shall be clearly defined to allow for a review by the Architect and Engineer of Record.
- C. Component Certification: Certify that mechanical and electrical components comply with the structural provisions of all applicable codes.
 - 1. Shop Drawings: Submit shop drawings for all attachments to the structure for all elements requiring structural design per these specifications. These attachments include, but are not limited to, structural bracing for equipment, conveyances, and architectural components; seismic restraints of vibration isolation systems; and details of lateral bracing and attachment systems designed to accommodate differential movement between building levels.
 - 2. Shop Drawings shall be sealed by the structural engineer responsible for their design.
- D. Quality Assurance Plan: Submit a quality assurance plan for the designated structural system of all elements requiring structural design per these specifications. Quality assurance plan shall comply with Owner's requirements and all applicable codes.

END OF SECTION

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SECTION 01 70 00 - EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Examination, preparation, and general installation procedures.
2. Pre-installation meetings.
3. Cutting and patching.
4. Surveying for laying out the work.
5. Cleaning and protection.
6. Starting of systems and equipment.
7. Demonstration and instruction of Owner personnel.
8. Closeout procedures, except payment procedures.

B. Related Requirements:

1. Section 01 30 00 "Administrative Requirements" for submittals procedures.
2. Section 01 40 00 "Quality Requirements" for testing and inspection procedures.
3. Section 01 74 19 "Construction Waste Management and Disposal" for additional procedures for trash/waste removal, recycling, salvage, and reuse.
4. Section 01 78 00 "Closeout Submittals" for project record documents, operation and maintenance data, warranties and bonds.
5. Section 07 84 13 "Penetration Firestopping".

1.2 SUBMITTALS

A. Refer to Section 01 30 00 "Administrative Requirements" for submittal procedures.

B. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.

1. On request, submit documentation verifying accuracy of survey work.
2. Submit a copy of site drawing signed by the Land Surveyor, that the elevations and locations of the work are in conformance with Contract Documents.
3. Submit surveys and survey logs for the project record.

C. Cutting and Patching: Submit written request in advance of cutting or alteration which affects:

1. Structural integrity of any element of Project.
2. Integrity of weather exposed or moisture resistant element.
3. Efficiency, maintenance, or safety of any operational element.
4. Visual qualities of sight exposed elements.
5. Work of Owner or separate Contractor.

1.3 QUALIFICATIONS

A. For demolition work, employ a firm specializing in the type of work required.

- B. For survey work, employ a land surveyor registered in Oregon and acceptable to Architect. Submit evidence of Surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate.
- C. For field engineering, employ a professional engineer of the discipline required for specific service on Project, licensed in Oregon.

1.4 PROJECT CONDITIONS

- A. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
- B. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere.
- C. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
- D. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations.

1.5 COORDINATION

- A. Coordinate scheduling, submittals, and work of the various Sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
- B. Notify affected utility companies and comply with their requirements.
- C. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various Sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- D. Coordinate space requirements, supports, and installation of mechanical and electrical work which are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
- F. Coordinate completion and clean-up of work of separate Sections.
- G. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

PART 2 - PRODUCTS

2.1 PATCHING MATERIALS

- A. New Materials: As specified in product Sections; match existing products and work for patching and extending work.
- B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.
- C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 60 00 "Product Requirements".

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.
- B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.
- C. Examine and verify specific conditions described in individual specification Sections.
- D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or mis-fabrication.
- E. Verify that utility services are available, of the correct characteristics, and in the correct locations.
- F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.2 PREPARATION

- A. Clean substrate surfaces prior to applying next material or substance.
- B. Seal cracks or openings of substrate prior to applying next material or substance.
- C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.3 PREINSTALLATION MEETINGS

- A. When required in individual specification Sections, convene a preinstallation meeting at the site prior to commencing work of the Section.
- B. Require attendance of parties directly affecting, or affected by, work of the specific Section.
- C. Notify Architect four days in advance of meeting date.
- D. Prepare agenda and preside at meeting:
 - 1. Review conditions of examination, preparation and installation procedures.
 - 2. Review coordination with related work.
- E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.4 LAYING OUT THE WORK

- A. Verify locations of survey control points prior to starting work.
- B. Promptly notify Architect of any discrepancies discovered.
- C. Protect survey control points prior to starting site work; preserve permanent reference points during construction.
- D. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.
- E. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to the Architect.
- F. Utilize recognized engineering survey practices.

- G. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
 - 1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
 - 2. Grid or axis for structures.
 - 3. Building foundation, column locations, ground floor elevations.
- H. Periodically verify layouts by same means.
- I. Maintain a complete and accurate log of control and survey work as it progresses.

3.5 GENERAL INSTALLATION REQUIREMENTS

- A. Install products as specified in individual Sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.
- B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.
- C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.
- D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.
- E. Make neat transitions between different surfaces, maintaining texture and appearance.

3.6 CUTTING AND PATCHING

- A. Execute cutting and patching including excavation and fill to complete the work, to uncover work in order to install improperly sequenced work, to remove and replace defective or non-conforming work, to remove samples of installed work for testing when requested, to provide openings in the work for penetration of mechanical and electrical work, to execute patching to complement adjacent work, and to fit products together to integrate with other work.
- B. Execute work by methods to avoid damage to other work, and which will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.
- C. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.
- D. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
- E. Restore work with new products in accordance with requirements of Contract Documents.
- F. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- G. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07 84 13 "Penetration Firestopping", to full thickness of the penetrated element.
- H. Refinish surfaces to match adjacent finish. For continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
- I. Make neat transitions. Patch work to match adjacent work in texture and appearance. Where new work abuts or aligns with existing, perform a smooth and even transition.

3.7 PROGRESS CLEANING

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

- B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.
- C. Broom and vacuum clean interior areas prior to start of surface finishing and continue cleaning to eliminate dust.
- D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.8 PROTECTION OF INSTALLED WORK

- A. Protect installed work from damage by construction operations.
- B. Provide special protection where specified in individual specification Sections.
- C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
- D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
- F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
- G. Remove protective coverings when no longer needed; reuse or recycle plastic coverings if possible.

3.9 STARTING SYSTEMS

- A. Coordinate schedule for start-up of various equipment and systems.
- B. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions which may cause damage.
- C. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
- D. Verify that wiring and support components for equipment are complete and tested.
- E. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.
- F. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.
- G. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.10 DEMONSTRATION AND INSTRUCTION

- A. Refer to Section 01 79 00 "Demonstration and Training".

3.11 ADJUSTING

- A. Adjust operating products and equipment to ensure smooth and unhindered operation.
- B. Testing, adjusting, and balancing HVAC systems: Refer to Division 23 "HVAC" Sections.

3.12 FINAL CLEANING

- A. Execute final cleaning prior to final project assessment.
 - 1. Clean areas to be occupied by Owner prior to final completion before Owner occupancy.

- B. Use cleaning materials that are nonhazardous.
- C. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.
- D. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
- E. Clean filters of operating equipment.
- F. Clean debris from roofs, gutters, downspouts, and drainage systems.
- G. Clean site; sweep paved areas, rake clean landscaped surfaces.
- H. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.13 CLOSEOUT PROCEDURES

- A. Make submittals that are required by governing or other authorities.
 - 1. Provide copies to Architect and Owner.
- B. Accompany Project Coordinator on preliminary inspection to determine items to be listed for completion or correction in Contractor's Notice of Substantial Completion.
- C. Notify Architect when work is considered ready for Substantial Completion.
- D. Submit written certification that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's review.
- E. Correct items of work listed in executed Certificates of Substantial Completion and comply with requirements for access to Owner-occupied areas.
- F. Accompany Project Coordinator on preliminary final inspection.
- G. Notify Architect when work is considered finally complete.
- H. Complete items of work determined by Architect's final inspection.

3.14 MAINTENANCE SERVICE

- A. Furnish service and maintenance of components indicated in specification Sections for one year from date of Substantial Completion.
- B. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.
- C. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.
- D. Maintenance service shall not be assigned or transferred to any agent or Subcontractor without prior written consent of the Owner.

END OF SECTION

SECTION 01 74 19 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

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 waste management and disposal.

1.3 WASTE MANAGEMENT REQUIREMENTS

- A. Owner requires that this project generate the least amount of trash and waste possible.
- B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.
- C. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.
- D. Required Recycling, Salvage, and Reuse: The following may not be disposed of in landfills or by incineration:
 - 1. Aluminum and plastic beverage containers.
 - 2. Corrugated cardboard.
 - 3. Wood pallets.
 - 4. Clean dimensional wood.
 - 5. Land clearing debris, including brush, branches, logs, and stumps: See Division 31 section for use options.
 - 6. Metals, including packaging banding, metal studs, sheet metal, structural steel, piping, reinforcing bars, door frames, and other items made of steel, iron, galvanized steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze.
 - 7. Glass.
 - 8. Gypsum drywall and plaster; per Earth Advantage Measure No. 2.1.3, 95% of job site drywall to be recycled.
 - 9. Plastic buckets.
 - 10. Carpet, carpet cushion, carpet tile, and carpet remnants, both new and removed: DuPont (<http://flooring.dupont.com>) and Interface (www.interfaceinc.com) conduct reclamation programs.
 - 11. Paint.
 - 12. Concrete.
 - 13. Bricks.
 - 14. Concrete Masonry Units (CMU).
 - 15. Asphalt.
- E. Contractor shall submit periodic Waste Disposal Reports; all landfill disposal, incineration, recycling, salvage, and reuse must be reported regardless of to whom the cost or savings accrues; use the same units of measure on all reports.

- F. Contractor shall develop and follow a Waste Management Plan designed to implement these requirements.
- G. Methods of trash/waste disposal that are not acceptable are:
 - 1. Burning on the project site.
 - 2. Burying on the project site.
 - 3. Dumping or burying on other property, public or private.
 - 4. Other illegal dumping or burying.
- H. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, State and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.4 RELATED SECTIONS

- A. Section 01 30 00 "Administrative Requirements": Additional requirements for project meetings, reports, submittal procedures, and project documentation.
- B. Section 01 50 00 "Temporary Facilities and Controls": Additional requirements related to trash/waste collection and removal facilities and services.
- C. Section 01 60 00 "Product Requirements": Waste prevention requirements related to delivery, storage, and handling.
- D. Sections 01 70 00 "Execution and Closeout Requirements" for trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

1.5 DEFINITIONS

- A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.
- B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.
- C. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.
- D. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.
- E. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.
- F. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.
- G. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.
- H. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.
- I. Return: To give back reusable items or unused products to vendors for credit.
- J. Reuse: To reuse a construction waste material in some manner on the project site.
- K. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.

- L. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.
- M. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.
- N. Toxic: Poisonous to humans either immediately or after a long period of exposure.
- O. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.
- P. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.6 SUBMITTALS

- A. See Section 01 30 00 "Administrative Requirements" for submittal procedures.
- B. Waste Management Plan: Include the following information:
 - 1. Analysis of the trash and waste projected to be generated during the entire project construction cycle, including types and quantities.
 - 2. Landfill Alternatives: List all waste materials that will be diverted from landfills by reuse, salvage, or recycling.
 - 3. Communication: Identify recycling manager for the project. Describe regular meetings to be held to address waste prevention, reduction, recycling, salvage, reuse, and disposal. Describe provided references, signage and other measures to be used onsite to help subcontractors, vendors and field personnel comply with waste diversion goals efficiently.
 - 4. Materials Handling Procedures: Describe the means by which materials to be diverted from landfills will be protected from contamination and prepared for acceptance by designated facilities; include separation procedures for recyclables, storage, and packaging.
 - 5. Transportation: Identify the destination and means of transportation of materials to be recycled; i.e. whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler.
 - 6. Goals: Clearly delineate goals of the Waste Management Plan including an explicit percentage target for landfill diversion of construction waste.
- C. Waste Disposal Reports: Submit at specified intervals, with details of quantities of trash and waste, means of disposal or reuse, and costs; show both totals to date and since last report.
 - 1. Submit updated Report with each Application for Progress Payment; failure to submit Report will delay payment.
 - 2. Submit Report on a form acceptable to Owner.
 - 3. Landfill Disposal: Include the following information:
 - a. Identification of material.
 - b. Amount, in tons or cubic yards, of trash/waste material from the project disposed of in landfills.
 - c. State the identity of landfills, total amount of tipping fees paid to landfill, and total disposal cost.
 - d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
 - 4. Incinerator Disposal: Include the following information:
 - a. Identification of material.

- b. Amount, in tons or cubic yards, of trash/waste material from the project delivered to incinerators.
 - c. State the identity of incinerators, total amount of fees paid to incinerator, and total disposal cost.
 - d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
- 5. Recycled and Salvaged Materials: Include the following information for each:
 - a. Identification of material, including those retrieved by installer for use on other projects.
 - b. Amount, in tons or cubic yards, date removed from the project site, and receiving party.
 - c. Transportation cost, amount paid or received for the material, and the net total cost or savings of salvage or recycling each material.
 - d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
 - e. Certification by receiving party that materials will not be disposed of in landfills or by incineration.
- 6. Material Reused on Project: Include the following information for each:
 - a. Identification of material and how it was used in the project.
 - b. Amount, in tons or cubic yards.
 - c. Include weight tickets as evidence of quantity.
- 7. Other Disposal Methods: Include information similar to that described above, as appropriate to disposal method.

PART 2 - PRODUCTS

- NOT USED -

PART 3 - EXECUTION

3.1 WASTE MANAGEMENT PROCEDURES

- A. See Section 01 30 00 for additional requirements for project meetings, reports, submittal procedures, and project documentation.
- B. See Section 01 50 00 for additional requirements related to trash/waste collection and removal facilities and services.
- C. See Section 01 60 00 for waste prevention requirements related to delivery, storage, and handling.
- D. See Sections 01 70 00 for trash/waste prevention procedures related to cutting and patching, installation, protection, and cleaning.

3.2 WASTE MANAGEMENT PLAN IMPLEMENTATION

- A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.
- B. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, Owner, and Architect.

- C. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.
- D. Meetings: Discuss trash/waste management goals and issues at project meetings.
 - 1. Pre-bid meeting.
 - 2. Pre-construction meeting.
 - 3. Regular job-site meetings.
- E. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
 - 1. Provide containers as required.
 - 2. Provide adequate space for pick-up and delivery and convenience to subcontractors.
 - 3. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.
- F. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.
- G. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.
- H. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.
- I. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

END OF SECTION

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SECTION 01 78 00 - CLOSEOUT SUBMITTALS

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. Project Record Documents.
 - 2. Operation and Maintenance Data.
 - 3. Warranties and bonds.
- B. Related Requirements:
 - 1. Section 01 30 00 "Administrative Requirements" for submittals procedures, shop drawings, product data, and samples.
 - 2. Section 01 70 00 "Execution and Closeout Requirements" for contract closeout procedures.
 - 3. Individual Product Sections for specific requirements for operation and maintenance data.
 - 4. Individual Product Sections for warranties required for specific products or Work.

1.3 SUBMITTALS

- A. Project Record Documents: Submit documents to Architect with claim for final Application for Payment.
- B. Operation and Maintenance Data:
 - 1. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Architect will review draft and return one copy with comments.
 - 2. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
 - 3. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Architect comments. Revise content of all document sets as required prior to final submission.
 - 4. Submit two sets of revised final documents in final form within 10 days after final inspection.
- C. Warranties and Bonds:
 - 1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
 - 2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
 - 3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2 - PRODUCTS

- NOT USED -

PART 3 - EXECUTION

3.1 PROJECT RECORD DOCUMENTS

- A. Maintain on site one set of the following record documents; record actual revisions to the Work:
 - 1. Drawings.
 - 2. Addenda.
 - 3. Change Orders and other modifications to the Contract.
- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction progress.
- E. Record Drawings: Legibly mark each item to record actual construction including:
 - 1. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - 2. Field changes of dimension and detail.
 - 3. Details not on original Contract drawings.

3.2 OPERATION AND MAINTENANCE DATA

- A. For Each Product or System: List names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.
- B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.
- C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.
- D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.3 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

- A. For Each Product, Applied Material, and Finish:
- B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.

3.4 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

- A. For Each Item of Equipment and Each System:
 - 1. Description of unit or system, and component parts.
 - 2. Identify function, normal operating characteristics, and limiting conditions.
 - 3. Include performance curves, with engineering data and tests.
 - 4. Complete nomenclature and model number of replaceable parts.
- B. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.

- C. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and troubleshooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- D. Provide servicing and lubrication schedule, and list of lubricants required.
- E. Include manufacturer's printed operation and maintenance instructions.
- F. Include sequence of operation by controls manufacturer.
- G. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- H. Additional Requirements: As specified in individual product specification sections.

3.5 OPERATION AND MAINTENANCE MANUALS AND VIDEOS

- A. Prepare instructions and data by personnel experienced in maintenance and operation of described products.
- B. Refer to Section 01 79 00 "Demonstration and Training" for requirements.
- C. Prepare data in the form of an instructional manual.
- D. Record video of each training session.

3.6 WARRANTIES AND BONDS

- A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until the Date of Substantial completion is determined.
- B. Verify that documents are in proper form, contain full information, and are notarized.
- C. Co-execute submittals when required.
- D. Retain warranties and bonds until time specified for submittal.

END OF SECTION

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SECTION 01 79 00 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Demonstration of products and systems to be commissioned and where indicated in specific specification Sections.
2. Training of Owner personnel in operation and maintenance is required for:
 - a. All software-operated systems.
 - b. HVAC systems and equipment.
 - c. Plumbing equipment.
 - d. Electrical systems and equipment.
 - e. Conveying systems.
 - f. Landscape irrigation.
 - g. Common Areas access control.
 - h. Parking Areas access and revenue controls.
 - i. Other components where indicated in individual product Sections.
3. Training of Owner personnel in care, cleaning, maintenance, and repair is required for:
 - a. Roofing, waterproofing, and other weather-exposed or moisture protection products.
 - b. Finishes, including flooring, wall finishes and ceiling finishes.
 - c. Fixtures and fittings.
 - d. Other components where indicated in individual product Sections.

B. Related Requirements:

1. Section 01 78 00 "Closeout Submittals" for operation and maintenance manuals.
2. Other Specification Sections for additional requirements for demonstration and training.

1.2 SUBMITTALS

A. Refer to Section 01 30 00 "Administrative Requirements" for submittal procedures; except:

1. Make all submittals specified in this Section, and elsewhere where indicated for commissioning purposes, directly to the Commissioning Authority.
2. Submit one copy to the Commissioning Authority, not to be returned.
3. Make commissioning submittals on time schedule specified by Commissioning Authority.
4. Submittals indicated as "Draft" are intended for the use of the Commissioning Authority in preparation of overall Training Plan; submit in editable electronic format, Microsoft Word 2003 preferred.

B. Draft Training Plans: Owner will designate personnel to be trained; tailor training to needs and skill-level of attendees.

1. Submit to Commissioning Authority for review and inclusion in overall training plan.
2. Submit not less than four weeks prior to start of training.

3. Revise and resubmit until acceptable.
4. Provide an overall schedule showing all training sessions.
5. Include at least the following for each training session:
 - a. Identification, date, time, and duration.
 - b. Description of products and/or systems to be covered.
 - c. Name of firm and person conducting training; include qualifications.
 - d. Intended audience, such as job description.
 - e. Objectives of training and suggested methods of ensuring adequate training.
 - f. Methods to be used, such as classroom lecture, live demonstrations, hands-on, etc.
 - g. Media to be used, such as slides, hand-outs, etc.
 - h. Training equipment required, such as projector, projection screen, etc., to be provided by Contractor.
- C. Training Manuals: Provide training manual for each attendee; allow for minimum of two attendees per training session.
 1. Include applicable portion of O&M manuals.
 2. Include copies of all hand-outs, slides, overheads, video presentations, etc., that are not included in O&M manuals.
 3. Provide one extra copy of each training manual to be included with operation and maintenance data. Provide in electronic Portable Document Format (PDF) as well, on USB storage device.
- D. Training Videos: Record video of each training session and provide a training video for each attendee for their training session; allow for minimum of two attendees per training session.
 1. Provide in one of the following video formats, or other supported by Google YouTube; www.support.google.com/youtube.
 - a. Audio Video Interleaved/ AVI (.avi).
 - b. ISO/IEC Moving Picture Experts Group/ MPEG-4 (.mp4).
 - c. Program stream/ MPEGPS (.mpg).
 - d. QuickTime/ MOV (.mov).
 - e. Windows Media Video/ WMV (.wmv).

1.3 QUALITY ASSURANCE

- A. Instructor Qualifications: Familiar with design, operation, maintenance and troubleshooting of the relevant products and systems.
 1. Provide as instructors the most qualified trainer of those contractors and/or installers who actually supplied and installed the systems and equipment.
 2. Where a single person is not familiar with all aspects, provide specialists with necessary qualifications.

PART 2 - PRODUCTS

- NOT USED -

PART 3 - EXECUTION

3.1 DEMONSTRATION - GENERAL

- A. Demonstrations conducted during system start-up do not qualify as demonstrations for the purposes of this Section, unless approved in advance by Owner.
- B. Demonstrations conducted during Functional Testing need not be repeated unless Owner personnel training is specified.
- C. Demonstration may be combined with Owner personnel training if applicable.
- D. Operating Equipment and Systems: Demonstrate operation in all modes, including start-up, shut-down, seasonal changeover, emergency conditions, and troubleshooting, and maintenance procedures, including scheduled and preventive maintenance.
 - 1. Perform demonstrations not less than two weeks prior to Substantial Completion.
 - 2. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.
- E. Non-Operating Products: Demonstrate cleaning, scheduled and preventive maintenance, and repair procedures.
 - 1. Perform demonstrations not less than two weeks prior to Substantial Completion.

3.2 TRAINING - GENERAL

- A. Commissioning Authority will prepare the Training Plan based on draft plans submitted.
- B. Conduct training on-site unless otherwise indicated.
- C. Owner will provide classroom and seating at no cost to Contractor.
- D. Do not start training until Functional Testing is complete, unless otherwise specified or approved by the Commissioning Authority.
- E. Provide training in minimum two hour segments.
- F. The Commissioning Authority is responsible for determining that the training was satisfactorily completed and will provide approval forms.
- G. Training schedule will be subject to availability of Owner's personnel to be trained; re-schedule training sessions as required by Owner; once schedule has been approved by Owner failure to conduct sessions according to schedule will be cause for Owner to charge Contractor for personnel "show-up" time.
- H. Review of Facility Policy on Operation and Maintenance Data: During training discuss:
 - 1. The location of the O&M manuals and videos, and procedures for use and preservation; backup copies.
 - 2. Typical contents and organization of all manuals, including explanatory information, system narratives, and product specific information.
 - 3. Typical uses of the O&M manuals and videos.
- I. Product- and System-Specific Training:
 - 1. Review the applicable O&M manuals and videos.
 - 2. For systems, provide an overview of system operation, design parameters and constraints, and operational strategies.
 - 3. Review instructions for proper operation in all modes, including start-up, shut-down, seasonal changeover and emergency procedures, and for maintenance, including preventative maintenance.

4. Provide hands-on training on all operational modes possible and preventive maintenance.
 5. Emphasize safe and proper operating requirements; discuss relevant health and safety issues and emergency procedures.
 6. Discuss common troubleshooting problems and solutions.
 7. Discuss any peculiarities of equipment installation or operation.
 8. Discuss warranties and guarantees, including procedures necessary to avoid voiding coverage.
 9. Review recommended tools and spare parts inventory suggestions of manufacturers.
 10. Review spare parts and tools required to be furnished by Contractor.
 11. Review spare parts suppliers and sources and procurement procedures.
- J. Be prepared to answer questions raised by training attendees; if unable to answer during training session, provide written response within three days.

END OF SECTION

SECTION 03 10 00 - CONCRETE FORMING

PART 1 GENERAL

1.1 SECTION SCOPE

- A. Concrete formwork, shoring, bracing, and anchorage.
- B. Concrete formwork accessories.

1.2 DESIGN REQUIREMENTS

- A. Design, engineer, and construct concrete formwork, shoring, and bracing in accordance with design and code requirements, resulting in concrete conforming to required shape, line, and dimension.

1.3 RELATED SECTIONS

- A. Section 03 20 00– Concrete Reinforcing.
- B. Section 03 30 00– Cast-in-Place Concrete.
- C. See also non-structural specifications.

1.4 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.
- B. Unless otherwise noted, standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes as of the date of issue of these Specifications.
- C. Referenced Standards:
 - 1. California Building Code (2019)
 - 2. ACI 117 – Specifications for Tolerances for Concrete Construction and Materials.
 - 3. ACI 301 – Specifications for Structural Concrete for Buildings.
 - 4. ACI 318 – Building Code Requirements for Structural Concrete.
 - 5. ACI 347 – Guide to Formwork for Concrete.
 - 6. AHA A135.4 – Basic Hardboard.
 - 7. PS 1 – Construction and Industrial Plywood.
 - 8. WCLIB Rule 17 – Standard Grading Rules for West Coast Lumber.

1.5 SUBMITTALS

- A. General: Submit as noted below and per division 1.

1.6 QUALITY ASSURANCE

- A. Regulatory Requirements: Conform to CBC for design, fabrication, erection, and removal of forms.
- B. Field Samples: Provide only as requested by Architect.
- C. Coordinate work in this section with work in related sections and with the work of other trades.

PART 2 PRODUCTS

2.1 FORM MATERIALS

A. Architectural Cast Concrete Finish:

1. Per architect: Plywood, 5/8 inch minimum thickness, conforming to APA Plyform, sound undamaged sheets with clean, true edges with joints taped or steel concrete forms or other approved material.
2. Cylindrical Forms: Per architect; Sonotube or other approved material.

B. Smooth Concrete Concealed from View: Plywood, 5/8 inch minimum thickness, conforming to APA B-B Plyform or better or steel concrete forms or other approved material.

C. Concrete Concealed from View:

1. 2x lumber; plywood, 5/8 inch minimum thickness conforming to APA Plyform; tempered concrete form hardboard conforming to AHA A135.4; steel concrete forms or other approved material.
2. Cylindrical Forms: Sonotube or other approved material.

2.2 ACCESSORIES

A. Form Ties:

1. Concrete Exposed to View: Galvanized metal snap ties with cone washers with 1 inch break back dimension, free of defects that could leave holes larger than 1 inch diameter in concrete surface. Verify with architect if there are special spacing requirements.
2. Concrete Concealed from View: Galvanized metal snap ties or wedge form ties.

B. Nails, Spikes, Lag Bolts, Through Bolts: Sized as required, of sufficient strength and character to maintain formwork in place while placing concrete. Not to be embedded in concrete.

C. Chamfer Strips: Wood, metal, or rubber strips; location and size as shown on drawings.

D. Expansion Joint Filler: Preformed, resilient, flexible, and non-extruding conforming to ASTM D1751.

E. Keyed Construction Joint: Minimum 24 gage galvanized steel; shaped with formed key (minimum 1-1/2 inch) for load transfer; and with knockouts for dowel placement. Acceptable products: G-33 Screed Key Joint manufactured by Dayton/Richmond Concrete Accessories (721 Richard St., Miamisburg, OH 45342; toll free: 800.745.3700; phone: 937.866.0711; fax: 937.866.8027; URL: <http://www.daytonrichmond.com>), or approved equal.

F. Spreaders: Metal (wood not permitted).

G. Form Release Agent: Commercially formulated form release agents that will not bond with, stain or adversely affect concrete surface, and will not impair subsequent treatment of concrete surfaces, nor impede the wetting of surfaces to be cured with water or curing compounds. Coating containing mineral oils or other non-drying ingredients will not be permitted. Apply coating in conformity with manufacturer's specifications before reinforcing steel is placed. "Nox-Crete Form Coating" as manufactured by The Nox-Crete Company, "Arcal-80" as manufactured by Arcal Chemical Corporation, "Synthex" as manufactured by Industrial Synthetics Company or approved equal.

PART 3 EXECUTION

3.1 EXAMINATION

- #### A. Examine job site conditions and verify field dimensions.

- B. Report unacceptable conditions. Begin installation only when unacceptable conditions have been corrected.

3.2 EARTH FORMS

- A. Concrete may be placed against neatly cut earth where feasible, conforming to the following criteria:
 - 1. Earth form trenches must be able to stand without caving in.
 - 2. Sluffage not permitted. Remove loose soil and all debris prior to placing concrete.
 - 3. Remove all standing water prior to placing concrete.

3.3 FORM CONSTRUCTION

- A. Erect formwork, shoring, and bracing in accordance with ACI 301.
- B. Construct formwork to maintain tolerances required by ACI 347.
- C. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads.
- D. Arrange and assemble formwork to permit ease of dismantling and stripping and prevent damage to concrete during stripping.
- E. Align joints and make watertight. Keep form joints to a minimum.
- F. Metal stakes in contact with reinforcing steel and all wood stakes that are used to support formwork or reinforcement are not permitted to occur within the finished concrete section.
- G. Protect underslab vapor barrier/retarder from damage at all times.
- H. Concrete work out of alignment, level or plumb will be cause for rejection of the whole work affected and, if so rejected, such work shall be removed and replaced as directed, with no additional cost to the Owner.
- I. When a concrete pour has been stopped for a sufficient length of time so that shrinkage or warp has separated the forms and the concrete, provide for form adjustment to draw the forms into firm contact with concrete before placing additional concrete. Take precautions to prevent any shoulder or ledge from being formed at a cold joint.

3.4 FORM RELEASE AGENT APPLICATION

- A. Apply form release agent on formwork in accordance with manufacturer's recommendations.
- B. Apply prior to placement of reinforcing steel, anchoring devices and embedded items.

3.5 INSERTS, EMBEDDED PARTS AND OPENINGS

- A. Locate and set in place items which will be cast directly into concrete.
- B. Ensure items are not disturbed during concrete placement.
- C. Obtain approval from Architect/Engineer before framing openings not specifically indicated on Drawings.

3.6 FORMWORK CLEANING AND INSPECTION

- A. Inspect erected formwork, shoring and bracing to ensure that work is in accordance with formwork design and that supports, fastenings, wedges, ties and embedded items are secure to prevent displacement and distortions.
- B. Clean forms and adjacent surfaces as formwork is erected and prior to concrete placement. Remove wood chips, sawdust, dirt, and other debris. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris are drained and removed.
- C. In the case where a Structural Observation is required or requested notify the Engineer at least 48 hours in advance of the beginning of pouring operations and at the completion of formwork construction. An observation will be made of the forms for approval of finished work and general layout only. The observation shall in no way relieve the Contractor of responsibility for the design and safety of formwork, shoring, and bracing.

3.7 FORM REMOVAL

- A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.
- B. Concrete must be allowed to cure long enough to avoid damage during form removal.
- C. Remove forms progressively and in accordance with ACI 318, Section 26.11.
- D. As a minimum, formwork and shoring shall remain in place for the following periods:
 - 1. Concrete on Grade: Minimum 24 hours.
 - 2. Concrete Not Supporting Weight of Concrete (formwork for sides of beams, walls, columns): Minimum 48 hours.
 - 3. Concrete Supporting Weight of Concrete (formwork for beam soffits, joists, structural slabs): 100% of 28-day compressive strength has been achieved. Compressive strength of concrete is to be determined by testing field or laboratory-cured test specimens.

3.8 FORM REUSE

- A. Forms in good condition may be reused.
- B. Clean and inspect forms prior to reuse. Do not reuse split, warped, delaminated, or otherwise damage forms that will impair surface condition and quality of cast concrete exposed to view.

3.9 CLEAN-UP

- A. Upon completion of the work of this section, remove all surplus materials, rubbish and debris from the premises.

END OF SECTION

SECTION 03 20 00 - CONCRETE REINFORCING

PART 1 GENERAL

1.1 SECTION SCOPE

- A. Concrete steel reinforcement and accessories.

1.2 DESIGN REQUIREMENTS

- A. Design, engineer, furnish, and install concrete reinforcing and accessories in accordance with design and code requirements.

1.3 RELATED SECTIONS

- A. Section 03 10 00– Concrete Forming.
- B. Section 03 30 00– Cast-in-Place Concrete.
- C. Section 04 22 00– Concrete Unit Masonry.

1.4 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.
- B. Unless otherwise noted, standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes as of the date of issue of these Specifications.
- C. Referenced Standards:
 - 1. California Building Code (2019)
 - 2. ACI 301 – Specifications for Structural Concrete for Buildings.
 - 3. ACI 315 – Details and Detailing of Concrete Reinforcing.
 - 4. ACI 318 – Building Code Requirements for Structural Concrete.
 - 5. ASTM A82 – Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
 - 6. ASTM A185 – Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
 - 7. ASTM A497 – Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete.
 - 8. ASTM A615 – Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
 - 9. ASTM A706 – Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.
 - 10. ASTM A1055 – Standard Specification for Zinc and Epoxy Dual-Coated Steel Reinforcing Bars
 - 11. CRSI Manual of Standard Practice
 - 12. AWS D1.4 – Structural Welding code – Reinforcing Steel.

1.5 SUBMITTALS

- A. General: Submit as noted below.
- B. Shop Drawings (as required per Structural Sheet SN.1):
 - 1. Prepare in accordance with ACI 315.
 - 2. Indicate bar sizes, spacings, locations, splicing, laps and quantities of steel reinforcement and wire fabric, bending and cutting schedules, and supporting and spacing devices.
 - 3. Identify shop drawings with reference to sheet and detail numbers from the Contract Documents.
 - 4. Do not use scaled dimensions from drawings to determine lengths of steel reinforcement.
 - 5. One of the submittal copies shall be reproducible.
 - 6. Contractor has responsibility for correctness and completeness of steel reinforcing requirements.
 - 7. Begin fabrication only when shop drawings have been approved.
- C. Product Data: Submit manufacturer's descriptive literature, installation instructions, and product specification for the following products:
 - 1. Mechanical splicing devices.
 - 2. Bar supports.
- D. Samples: As noted below.
- E. Control Submittals:
 - 1. Submit certified copies of mill test reports of reinforcing materials analysis to Owner's testing agency.

1.6 QUALITY ASSURANCE

- A. Perform work in accordance with CRSI Manual of Standard Practice, ACI 301, and CBC Chapter 19.
- B. Manufacturers and Installers shall be companies or individuals who are regularly engaged in this business.
- C. Welding procedures, welding operators and welders shall be qualified in accordance with AWS D1.4.
- D. Structural Tests and Inspections: As required per Structural Sheet SN.1, CBC Chapter 17, and Building Jurisdiction.
- E. Coordinate work in this section with work in related sections and with the work of other trades.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver steel reinforcement in bundles marked with identification tags.
- B. Handle and store materials to prevent damage and contamination, excessive rusting or coating with grease, oil, or other objectionable materials.
- C. Store steel reinforcement, fabricated assemblies, and accessories off the ground on platforms, skids, or other supports.
- D. Deliver and store welding electrodes in accordance with AWS D1.4.

PART 2 PRODUCTS

2.1 STEEL REINFORCEMENT

- A. Reinforcing Steel: ASTM A615, Grade 40 for #4 bars and smaller, Grade 60 for #5 bars and larger, deformed billet steel bars.
- B. Reinforcing Steel (weldable): ASTM A706, Grade 60, low-alloy deformed steel bars.
 - 1. Where specified on the plans, reinforcing steel shall also conform to ASTM A1055 for zinc and epoxy dual-coated reinforcing.
- C. Dowel Bars: Same grade as bars to which dowels are connected.
 - 1. Where specified on the plans, dowels shall also conform to ASTM A1055 for zinc and epoxy dual-coated reinforcing.
- D. Plain Steel Wire (may be used for spiral reinforcement): ASTM A82.
- E. Welded Wire Fabric: ASTM A185, 65 ksi minimum yield strength, fabricated from as-drawn steel wire into flat sheets (rolled fabric not permitted). Size: Per Structural drawings.
- F. Tie Wire: FS QQ-W-461 (ASTM A497), annealed steel wire, 16 gage minimum.

2.2 ACCESSORIES

- A. Bar Supports (Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place): Provide in accordance with CRSI Manual of Standard Practice from steel wire, plastic, or precast concrete or fiber-reinforced concrete of equal to or greater compressive strength than surrounding concrete. Provide as follows:
 - 1. Footings: Precast concrete blocks with tie wires.
 - 2. Slab on grade: Precast concrete blocks, plastic coated steel fabricated with bearing plates, or specifically designed wire-fabric supports fabricated of plastic.
 - 3. Where legs of wire bar supports contact forms: CRSI Class 1 plastic-protected or CRSI Class 2 stainless steel bar supports.
 - 4. Where support is no closer to concrete surface than 1/2 inch: CRSI Class 3 wire supports.
 - 5. Supports placed against ground: Precast concrete blocks not less than 4 inch square with embedded wire.
- B. Welding Materials:
 - 1. Welding electrode: AWS D1.4, low hydrogen, E70XX series.
- C. Mechanical Splices: Splicing devices capable of developing 125 percent of the specified yield strength of the bar in compression and tension. Acceptable mechanical splices:
 - 1. Metal sleeve with cast filler metal, mechanical threaded connections using a metal coupling sleeve with internal threads, or approved equal. Mechanical splices shall have an ICBO report and manufacturer's literature submitted to the Engineer for approval prior to use of mechanical splice.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine job site conditions and verify field dimensions.

- B. Report unacceptable conditions. Begin installation only when unacceptable conditions have been corrected.

3.2 STEEL REINFORCEMENT FABRICATION

- A. Fabricate to shapes and dimensions in accordance with approved shop drawings conforming to CRSI Manual of Standard Practice, ACI 315, ACI 318, and CBC Chapter 19 as follows:
 - 1. Standard Hooks: ACI 318 chapter 25
 - 2. Minimum Bend Diameters: ACI 318 chapter 25.
 - 3. Bending: ACI 318 chapter 25. Cold bend steel reinforcement in the field or at the mill. Heating for bending is not permitted unless otherwise specifically allowed.
- B. Spirals: Provide 1-1/2 finishing turns at top and bottom with minimum 135 degree hook at each end. Lap splice at 48 bar diameters minimum with 135 degree hooks into the confined core at ends.
- C. Weld steel reinforcement in accordance with AWS D1.4.
- D. Clean steel reinforcement of rust and mill scale, earth, moisture, and other foreign materials before fabrication or placement and prior to placement of concrete.
- E. Fabricate reinforcement in accordance with the requirements of ACI 315 where specific details are not shown or where Drawings and Specifications are not more demanding.

3.3 REINFORCEMENT PLACEMENT

- A. Place steel reinforcement in accordance with approved shop drawings conforming to CRSI Manual of Standard Practice.
- B. All reinforcement shall be accurately set in place, lapped, spliced, spaced rigidly and securely held in place and tied with wire at all splices and crossing points with the wire ties pointed away from the form.
- C. Install steel reinforcement in largest practical lengths.
- D. Concrete Cover: Refer to Structural Drawings.
- E. Laps: Refer to Structural Drawings.
 - 1. Offset laps in adjacent bars.
 - 2. Tie securely to prevent displacement during concrete placement.
- F. Splices (other than lap splices):
 - 1. Install mechanical splice in accordance with manufacturer's written instructions.
- G. Welding:
 - 1. Welding is not permitted unless specifically detailed on drawings or approved by Architect.
 - 2. Employ shielding metal-arc method. Comply with AWS D1.4.
 - 3. Welding is not permitted on bars where the carbon content is not known or is determined to exceed 0.75%.
 - 4. Welding is not permitted within 2 bar diameters of any bent portion of a bar which has been bent cold.
 - 5. Welding of crossing bars is not permitted.

- H. Maintain minimum clear distance between parallel bars at not less than 1-1/2 times nominal bar diameter, 1-1/2 times maximum size of coarse aggregate, or 1-1/2 inch.
- I. Dowels at Doweled Joints: Place where indicated on the drawings. Grease loose end to prevent concrete from bonding to dowel. Sleeves may be used when approved.
- J. Welded Wire Fabric: Install in longest practical lengths on bar supports to minimize sagging. Lap edges and ends of adjoining sheets at least 24 inches. Offset laps to avoid continuous laps in either direction. Tie lap joints at 12 inches on center.
- K. Field Adjustments: Move steel reinforcement as necessary to avoid interference with other reinforcing steel, conduits or other embedded items within approved tolerances.
 - 1. Do not cut bars to clear sleeves or slots through slabs or walls. Bend bars around these openings.
 - 2. Compensate for steel reinforcement terminated at openings in slabs by placing one half of steel reinforcement terminated on each side of openings for the full length of opening plus two times the lap splice length, center on opening.
 - 3. Steel reinforcement moved to avoid interference with other reinforcements, conduits, or embedded items, including additional steel reinforcement to meet structural requirements are subject to inspection and approval before concrete placement.

3.4 REINFORCEMENT INSPECTION

- A. Testing Service: Owner will select and pay for independent testing agency, which will perform the following:
 - 1. Inspect shop and field welding per AWS D1.4, including checking materials, equipment, procedures, and welder qualifications.
 - 2. Inspector shall employ non-destructive testing or any other aid to visual inspection deemed necessary to assure adequacy of weld.
 - 3. Additional requirements for testing and inspection: Refer to Structural Drawings
- B. Placement of steel reinforcement shall be inspected where noted on the Structural Drawings.

3.5 PROTECTION

- A. Protect steel reinforcement from damage and displacement.
- B. Protect for potential rust staining of adjacent surfaces. Wrap steel reinforcement with impervious tape or other methods as approved. Remove protective cover and clean reinforcement before concrete placement.
- C. Install safety caps on all exposed ends of vertical steel reinforcement that pose a danger to life safety.

END OF SECTION

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SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 SECTION SCOPE

- A. Cast-in-place concrete.
- B. Concrete admixtures.
- C. Curing and surface slab treatment.
- D. Grouting, bonding, and patching materials.
- E. Accessories:
 - 1. Underslab vapor barrier/retarder.

1.2 DESIGN REQUIREMENTS

- A. Furnish, place, and finish cast-in-place concrete and accessories in accordance with design and code requirements.

1.3 RELATED SECTIONS

- A. Section 03 10 00– Concrete Forming.
- B. Section 03 20 00– Concrete Reinforcing.
- C. Division 7 – Damp-proofing
- D. See also non-structural specifications.

1.4 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.
- B. Unless otherwise noted, standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes as of the date of issue of these Specifications.
- C. Referenced Standards:
 - 1. California Building Code (2019)
 - 2. ACI 117 – Standard Tolerances for Concrete Construction and Materials.
 - 3. ACI 301 – Specifications for Structural Concrete.
 - 4. ACI 302 – Guide for Concrete Floor and Slab Construction.
 - 5. ACI 305R – Hot Weather Concreting.
 - 6. ACI 306 – Standard Specification for Cold Weather Concreting.
 - 7. ACI 318 – Building Code Requirements for Structural Concrete.
 - 8. ACI 360R – Design of Slabs on Ground.
 - 9. ASTM C31 – Standard Practice for Making and Curing Concrete Test Specimens in the Field.

- 10. ASTM C33-03 – Standard Specifications for Concrete Aggregates.
- 11. ASTM C39 – Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
- 12. ASTM C94 – Standard Specification for Ready-Mixed Concrete.
- 13. ASTM C143 – Standard Test Method for Slump of Hydraulic Cement Concrete.
- 14. ASTM C150 – Standard Specification for Portland Cement.
- 15. ASTM C172 – Standard Practice for Sampling Freshly Mixed Concrete.
- 16. ASTM C192 – Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory.
- 17. ASTM C260 – Standard Specification for Air-Entraining Admixtures for Concrete.
- 18. ASTM C330 – Standard Specification for Lightweight Aggregates for Structural Concrete.
- 19. ASTM C494 – Standard Specification for Chemical Admixtures for Concrete.
- 20. ASTM C618 – Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.
- 21. ASTM C881 – Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete.
- 22. ASTM C928 – Standard Specification for Packaged, Dry, Rapid-Hardening Cementitious Materials for Concrete Repairs.
- 23. ASTM C1077 – Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation.
- 24. ASTM C1107 – Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
- 25. ASTM C1059 – Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete.
- 26. ASTM E1745-97 – Standard Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.

1.5 SUBMITTALS

- A. General: Submit as noted below and per division 1.
- B. Concrete Mix Designs: As required per Structural sheet SN.1.
- C. Product Data: Submit manufacturer's descriptive literature and product specification for each product. Include manufacturer's written instructions and installation procedures.
- D. Samples: Submit product samples when requested by Architect or testing laboratory.
- E. Control Submittals (when requested):
 - 1. Certificates:
 - a. Manufacturer's certification that materials (cementitious materials, aggregates, and admixtures) conform to specifications.
 - 2. Test Reports.
 - 3. Batch Ticket: Furnish accepted batch tickets at the time of delivery for each concrete load. Indicate on each ticket equipment used for measuring and quantities, by weight, of cement, sand, each class of aggregate, admixtures, and amount of water in the aggregate, water added at the

batching plant, and any water withheld at the batch plant. In addition, include mix number, total yield in cubic yards, date and time of day (dispatch time, plant departure time, site arrival time, unloading start and end time).

4. Concrete Placement Record: Keep a record on site including time and date of concrete placing for portions of the structure for the duration of the project. Record additional information not included in batch ticket such as admixtures added at the job site. Make records available for inspection.

1.6 QUALITY ASSURANCE

A. Qualifications:

1. Concrete Supplier: Firm specializing in products specified in this section.
2. Concrete Batch Plant: Certified per NRMCA Plant Certification Checklist.
3. Independent Testing Laboratory: Acceptable to the Engineer.

B. Structural Tests and Inspections: As required per Structural Sheet SN.1, CBC Chapter 17, and Building Jurisdiction.

C. Coordinate work in this section with work in other sections and with the work of other trades.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products in manufacturer's original containers, dry and undamaged, with seals and labels intact.
- B. Store cement and other cementitious materials in weathertight buildings, bins, or silos which exclude moisture and contaminants and keep building materials completely separated.
- C. Arrange and use aggregate stockpiles in a manner to avoid excessive segregation and to prevent contamination with other materials or with other sizes of aggregates. Do not store aggregates directly on ground unless a sacrificial layer is left undisturbed.
- D. Do not use admixtures which have been in storage at the project site for longer than 6 months or which has been subjected to freezing unless these are retested and proven to meet the specified requirements.
- E. Clearly and accurately label materials after containers have been opened.

PART 2 PRODUCTS

2.1 CONCRETE MATERIALS

A. Cementitious Materials:

1. Cement: ASTM C150, Type as required per Structural sheet SN.1, low alkali.
2. Supplementary Cementitious Materials:
 - a. Fly Ash: ASTM C618.

B. Aggregates:

1. Fine and coarse aggregates: ASTM C33. Uniformly graded per Structural Drawings.

2. Maximum nominal size of coarse aggregate: per Structural Drawings and as follows:
 - a. 1 inch.

C. Water: Per Structural Drawings, potable and complying with ASTM C94/C94M.

D. Admixtures:

1. General:
 - a. Manufacturer certified to contain no more than 0.1 percent water-soluble chloride ions by mass of cementitious material. Admixtures containing calcium chloride or thiocyanates not allowed.
 - b. Compatible with other admixtures and cementitious materials in the concrete mix.
 - c. Obtain Engineer's written approval prior to use of admixtures.
2. Air Entraining Agents: ASTM C260.
3. Water Reducing: ASTM C494.

2.2 CURING MATERIALS AND SLAB TREATMENT

A. General:

1. Obtain Engineer's written approval prior to use of curing materials and slab treatments.
2. Comply with regulations of the California Air Resources Board and the local Air Pollution Control/Air Quality Management District.
3. Before use of any curing compounds, Contractor shall provide written approval by subsequent trades. Approval shall indicate all products are compatible and will not be adversely affected by the use of the curing compound. Failure to do so will require the removal of affected material by the contractor at no additional cost to the Owner. This includes but is not limited to tile products, carpeting and other adhesively applied products.

2.3 GROUTING, BONDING, AND PATCHING MATERIALS

A. Grout:

1. Non-shrink Grout: ASTM C1107, Type B or C, non-metallic aggregate grout, 8000 psi minimum 28-day compressive strength.
2. Non-shrink Drypack Grout: Non-shrink, natural aggregates, 8000 psi minimum 28-day compressive strength.

B. Bonding Materials:

1. Structural Bonding Epoxy Adhesive: 2 component, 100 percent solids, 100 percent reactive; meets or exceeds ASTM C881, Type V, Grade 2, Class B or C as appropriate.

2.4 ACCESSORIES

A. Underslab Vapor Barrier/Retarder: Per Structural Drawings and as specified in this Section.

1. Properties:
 - a. Thickness: Per Structural Drawings.
2. Approved Products: Provide one of the following, or other product meeting the moisture vapor emission rate requirement of concrete moisture vapor reduction admixture:
 - a. Vapor Block VB15 by Raven Industries Inc.; www.ravenefd.com.
 - b. Stego Wrap 15 mil Class A by Stego Industries, LLC; www.stegoindustries.com.

- c. Perminator 15 mil by W. R. Meadows, Inc.; www.wrmeadows.com.
- 3. Accessories:
 - a. Seam Tape: As recommended by underslab vapor barrier/retarder manufacturer.
 - b. Vapor Proofing Mastic: As recommended by underslab vapor barrier/retarder manufacturer.
- B. Bedding Layer: Per Structural Drawings.
- C. Capillary Barrier: Per Structural Drawings.
- D. Expansion Joints: Per Section 03 10 00.
- E. Anchors, Anchor Bolts, Nuts, and Washers: Per Section 05 12 00.

2.5 CONCRETE MIX

- A. General:
 - 1. Proportion concrete design mixes per ACI 301 Section 3.9 and CBC Section 1905.
 - 2. Proportion concrete design mixes per CBC Chapter 19 (Design mix based on laboratory tests) prepared and tested by an independent testing laboratory prior to design mix approval.
 - 3. Proportion by field experience may be permitted, where concrete manufacturer can establish the uniformity of its production for concrete of similar type and strength based on recent test data in accordance with CBC Section Chapter 19.
 - 4. Proportion concrete design mix to attain compressive strength as specified per plan or as specified below and as needed, with early strength to meet Contractor's work program.
- B. Mix Design:
 - 1. As required per Structural sheet SN.1.
- C. Admixtures:
 - 1. Use specified admixtures as accepted by Engineer. Verify compatibility of concrete admixtures when using multiple admixtures. Verify compatibility with architectural finishes and subsequent materials to be applied to finished concrete.

2.6 CONCRETE MIXING

- A. Ready-Mixed Concrete: Per CBC Section Chapter 19; measure, batch, mix, and deliver according to ASTM C94/C94M.
- B. Job-Mixed Concrete: Per CBC Section Chapter 19.

2.7 SOURCE QUALITY CONTROL

- C. Owner shall employ a testing laboratory accepted by Engineer to perform the following:
 - 1. Review mix designs and certificates of compliance for materials Contractor proposes to use.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine and verify the following prior to concrete placement.
 - 1. Forms are erected, adequately braced, sealed, lubricated (if required), and bulkhead provided where placing is to stop.
 - 2. Thoroughly water soak wood forms other than plywood at least 12 hours before concrete placement.
 - 3. Steel reinforcement are accurately positioned, securely tied and braced. Verify concrete cover requirements.
 - 4. Coordination with related work is completed.
 - 5. Anchors and embedded items are in position, securely held and braced.
 - 6. Construction joints and previously placed concrete are prepared as specified.
 - 7. Compliance with cold-weather or hot-weather requirements.
 - 8. Compliance with cleaning and preparation requirements.
- B. Report unacceptable conditions to the Engineer. Begin installation only when unacceptable conditions have been corrected.
- C. Concrete formwork, reinforcement, inserts, and embedded items are subject to Engineer's approval. Notify Engineer at least 48 hours prior to concrete placement.

3.2 PREPARATION

- A. Underslab Vapor Barrier/Retarder: Install in accordance with manufacturer's instructions, ASTM E1643, and as specified in this Section.
 - 1. Lay vapor barrier/retarder using the greatest widths and lengths practicable to eliminate joints wherever possible.
 - 2. Seal all penetrations per manufacturer's instructions using mastic and seal tape. No penetration of underslab vapor barrier/retarder is permitted except for reinforcing steel and permanent utilities.
 - 3. Replace torn, punctured or damaged underslab vapor barrier/retarder material prior to placing concrete.
 - 4. Control concrete placement so as to prevent damage to underslab vapor barrier/retarder.
- B. Cleaning: Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt and other debris before placing concrete.
- C. Refer to Section 03 11 00 for formwork preparation.
- D. Refer to Section 03 20 00 for reinforcing steel preparation.

3.3 PLACING CONCRETE

- A. Place concrete in accordance with ACI 301 and as specified in this Section.
- B. Add no water during delivery and at the project site unless total water added at plant is less than design water to attain slump of accepted mix design. Water may be added to concrete at job site, not to exceed the design water content. If additional slump is required, use water reducing admixture.

- C. Handle concrete from mixer to forms in a continuous manner.
- D. Deposit concrete as close as possible to its final position in the forms, with no vertical drop greater than 4 feet except where suitable equipment is provided to prevent segregation and where specifically authorized.
- E. Deposit concrete continuously or in 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 concrete cannot be placed continuously, provide construction joints as specified. Deposit concrete to avoid segregation.
- F. Deposit concrete in forms in horizontal layers no deeper than 24 inches and in a manner to avoid inclined construction joints. Place each layer while preceding layer is still plastic to avoid cold joints.
- G. Consolidate all concrete by suitable means during placement. Concrete shall be thoroughly worked around reinforcement and embedded fixtures and into the corners of forms.
- H. Concrete Floors and Slabs: 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. Maintain reinforcement in position on chairs during concrete placement.
 - 2. Screed slab surfaces with a straightedge and strike off to correct elevations.
 - 3. Slope exterior surfaces for drainage as directed, unless otherwise shown.
- I. Hot Weather Concreting: Place concrete according to ACI 305R and as follows:
 - 1. Cool components before mixing to maintain concrete temperature below 85 degrees F at time of placement. Chilled mixing water or chopped ice may be used to control temperature. Calculate and include water equivalent of ice in designed water cement ratio.
 - 2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
 - 3. Dampen forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.
 - 4. Protect concrete from surface drying. Methods may include but are not limited to: evaporation retardant, sun shades, wind breaks, and fog misting.
- J. Cold Weather Concreting: Place concrete according to ACI 306 and as follows:
 - 1. Protect concrete work from physical damage or reduced strength as a result of frost, freezing, or low temperatures.
 - 2. When ambient temperature is expected to fall below 40 degrees F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 degrees F.
 - 3. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade.
 - 4. Do not incorporate calcium chloride, salt or other materials containing antifreeze agents into the concrete mix.
 - 5. Upon written approval and subject to prior approval of mix design, accelerating admixtures, containing no calcium chloride, as specified in this section may be used.

3.4 JOINTS

- A. Construction Joints: Comply with CBC Section Chapter 19. Install joints so strength and appearance of concrete is not impaired at locations indicated or as accepted by Engineer.
 - 1. Continue reinforcement across construction joints unless otherwise indicated.
 - 2. Expose concrete aggregates creating a rough surface. Within 24 hours after placing concrete, remove retarded surface mortar using either high pressure water jetting or stiff brushing or a combination of both to expose coarse aggregate. A rough surface of exposed aggregate may also be produced by sandblasting followed by high pressure water jetting.
 - 3. Surface of construction joint is to be cleaned and laitance removed. Immediately before new concrete is placed, joint shall be wetted and standing water removed.
 - 4. Where new concrete joins existing concrete (concrete more than 60 days old), clean and roughen existing concrete to expose coarse aggregate. Coat with epoxy bonding compound prior to placing new concrete.
- B. Slab-on-Grade Control Joints: Tool or saw-cut weakened plane joints at a depth of at least 1/4 slab thickness where shown on drawings. Where not indicated in the drawings, provide at distances (in feet) every 2 to 3 times of slab thickness (in inches).
 - 1. Sawed Joint: Saw cut 1/4 inch width as soon as the concrete has hardened sufficiently to prevent raveling (dislodging of the aggregates) of the edges of the saw cut and completed before shrinkage stresses become sufficient to produce cracking.
 - 2. Fill control joint with epoxy joint filler in accordance with manufacturer's written instructions.
- C. Slab-on-Grade Expansion Joints and Isolation Joints: Provide expansion joints and isolation joints where shown on the drawings, where slab abuts vertical surfaces, at curbs, gutters, and sidewalks.
 - 1. Extend joint-filler strips full width and extend to full depth of joint, terminating not less than 1/2 inch nor more than 1 inch from finish surface.
 - 2. Install strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
- D. Dowel Joints: Install dowel sleeves and dowels or dowel bar and support assemblies at joints where shown on the drawings.

3.5 CONCRETE FLOORS AND SLABS FINISHING

- A. Comply with ACI 302.1R. Comply with flatness and levelness tolerance requirements of this Section.
- B. Floor Slab Levels: All surfaces shall finish true to 1/4" in 10 feet on a straight-edge in any direction with maximum high and low variance occurring in not less than 20 feet and with 1/16" maximum tolerance in any one running foot. Particular care shall be taken to finish troweling around the edges of the slabs so finish surface at edges shall be at same elevations as the rest of the top surface of the slab. Slabs shall be laid to temporary screeds set level at the proper elevations.
- C. Finishing:
 - 1. Steel Trowel Finish: All interior slabs and exterior curbs shall receive a monolithic steel trowel finish. Surfaces shall be screeded, woodfloated, and steel-troweled.
 - 2. Broomed Finish: Broomed finish for exterior slabs, when noted on drawings, shall be finished same as steel trowled finish, except that after hand troweling, finish surfaced by scoring in parallel lines with a fine hair stable broom perpendicular to the direction of traffic or as indicated on the drawings, and as directed.

3. Exposed Aggregate: Exposed Aggregate finish for exterior slabs, where noted on drawings, shall be finished same as steel trowel finish, except that prior to steel troweling slab shall be seeded with pea gravel as noted on drawings. After finish is partially set and walkable, broom and wash to partially expose the pea gravel.
4. Special Finishes: Toned concrete, where specified on the architectural plans, shall be finished per manufacturer's specifications. Contractor shall submit one test panel 12"x12" minimum for each type of finish.
5. Addition of Materials: The addition of cement, sand, water, or mortar to slab surfaces while finishing concrete is strictly prohibited.

3.6 CURING AND PROTECTION

- A. Protect freshly placed concrete from premature drying, rapid temperature change, mechanical injury, and injury from flowing water for a curing period not less than 7 days. Concrete shall be maintained above 50 degrees F and in a moist condition during this time. Comply with ACI 306 for cold-weather protection and ACI 305R for hot-weather protection during curing.
- B. Contact Engineer for curing method options if above conditions cannot be met.
- C. Verify compatibility of curing compounds with architectural finishes and subsequent materials to be applied to finished concrete.
- D. Protection:
 1. Protect concrete surfaces from damage by tools, equipment, materials, and construction activity.
 2. Traffic, shoring, or loading will not be permitted on concrete surface until it has sufficiently hardened to prevent injury to finish and strength.

3.7 REMOVAL OF FORMS

- A. Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 degrees F for 24 hours after placing concrete provided concrete is hard enough not to be damaged by form-removal operations and provided curing and protection operations are maintained.
- B. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved the following:
 1. At least 70 percent of 28-day design compressive strength.
 2. Determine compressive strength of in-place concrete by testing representative field or laboratory-cured test specimens according to ACI 301.
 3. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

3.8 CONCRETE REPAIRS

- A. Defective Concrete: Concrete is deemed defective if it meets any of the following conditions:
 1. Concrete not meeting 100% of the specified 28-day design compressive strength.
 2. Concrete exhibiting rock pockets, voids, spalls, cracks, and exposed reinforcing to the extent that strength, durability, or appearance is adversely affected.
 3. Concrete significantly out of place, line, or level.
 4. Concrete not containing required embedded items.

- B. Upon determination that concrete strength is defective core samples shall be taken and tested from the in-place concrete. Cores shall be taken and tested in accordance with ASTM C 42 and C 39. If required, perform structural repairs subject to the Engineer's approval.
- C. Upon determination that concrete surface is defective repairs may be made per below. Repair work shall not begin until procedure has been reviewed and approved by the Engineer.
 - 1. After form removal, cut out honeycomb, rock pockets, and voids more than 1/2 inch in any direction in solid concrete. 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 drypack grout before bonding agent has dried.
 - 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, repair mortar will match surrounding color. Patch a test area at inconspicuous location to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
 - 3. Repair defects on concealed, formed surfaces that affect concrete's durability and structural performance as determined by Engineer.
 - 4. Correct high spots by grinding after concrete has cured 14 days.
 - 5. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar.
 - 6. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply mortar underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 - 7. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least 3/4 inch clearance all around. Dampen concrete surface in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mix as original concrete.
 - 8. Repair random cracks and single holes 1 inch or less in diameter with drypack grout. 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 drypack grout before bonding agent has dried. Compact and finish to match adjacent concrete.

3.9 FIELD QUALITY CONTROL

- A. Testing Service: Owner will select and pay for independent testing agency.
- B. Test Specimen Cylinders: Conduct sampling, curing, and testing per ASTM C172, ASTM C31/C31M, and ASTM C39/C39M in accordance with CBC Chapter 19.
 - 1. Frequency: For each type of concrete, provide at least one set of 3 concrete test cylinders taken not less than once a day, or not less than once for each 50 cubic yards, or not less than once for each 3500 square feet of slab or wall surface area, or as required per plans.
 - 2. Cylinder Label and Records: Mark and date each test cylinder. Maintain records of test specimen cylinders and send copies to Engineer and Owner. Record the following information:
 - a. Cylinder identification mark.
 - b. Date made.
 - c. Concrete supplier.
 - d. Slump.

- e. Specified concrete design strength.
 - f. Pour location and type of structural member.
 - g. Compressive strength test date and age.
 - h. Admixtures added to concrete mix.
- 3. Compressive Strength Tests: Test laboratory cured specimens first at age 7 days, second at age 28 days, hold third specimen as reserve.
 - 4. Test Reports: Furnish 2 copies of test reports directly from testing agency to Engineer and Owner.
- C. Slump Test: Not required.
- D. In the event the cylinders tested do not meet the required concrete design strength, conduct core tests and additional tests or inspections as may be required by Engineer to ascertain strength of placed concrete.

END OF SECTION

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SECTION 03 35 43 - POLISHED CONCRETE FLOOR FINISHING

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. Multi-step wet grinding, chemical treatment for hardening, multi-step free abrasive polishing, permanently sealed floor not requiring topical guard or sealer.
- B. Related Requirements:
 - 1. Section 03 30 00 "Cast-in-Place Concrete" for coordination of formwork, reinforcement, concrete materials including aggregates, mixture design, placement procedures, initial finishing, and curing for cast-in-place concrete to receive polished concrete finishing.
 - 2. Section 07 92 00 "Joint Sealants" for concrete floor joint sealants.

1.3 DEFINITIONS

- A. Design Reference Sample: Sample designated by Architect in the Contract Documents that reflects acceptable surface quality and appearance of polished concrete.

1.4 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 polished concrete to attend, including the following:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixtures, if available. Coordinate with Owner for their testing agency representative.
 - c. Ready-mix concrete manufacturer.
 - d. Cast-in-place concrete subcontractor.
 - e. Polished concrete finishing Subcontractor.
 - 2. Review curing procedures, construction joints, concrete repair procedures, concrete finishing, and protection of polished concrete.

1.5 SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Certification of Mix Design Review: Polished concrete finish applicator's review of the mix design(s) submitted per Section 03 30 00 "Cast-In-Place Concrete" for concrete to receive polished concrete finish.
 - 2. Slip Resistance of Finished Floor: Test data for representative sample of similarly finished concrete previously produced by the polished concrete finish applicator, demonstrating compliance with slip resistance requirements.

- B. Polishing Schedule: Submit plan showing polished concrete surfaces and schedule of polishing operations for each area of polished concrete before start of polishing operations. Include locations of all joints, including construction joints.
- C. Mock-up: A mock-up is required to provide the approved basis for comparison and acceptance of completed polished concrete finishing on the Project. The mock-up will be reviewed for approval based on appearance, sequence of installation, quality of execution, and conformance with design intent as indicated in the Project Documents. The basis for approval of the mock-up will be the approved verification sample.
- D. Qualification Data: For polished concrete finish applicator.
- E. Material Certificates: For each of the following, signed by manufacturers:
 - 1. Repair materials.
 - 2. Liquid floor treatments.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Work of this Section shall be performed by installer having knowledge of finish methods, concrete mix designs, and equipment suitable for the concrete finish specified. Installer shall:
 - 1. Have completed a minimum of five years with successful installations with specified finishes.
 - 2. Be a qualified firm that is approved, authorized, trained or licensed by finish system manufacturer to install manufacturer's product.
- B. Mock-Up: Designate an Individual to be responsible for quality control. Individual shall be on site at all times work is actively in progress. Mock-up: Before casting concrete, perform concrete polishing mock-up to demonstrate surface finish and standard of workmanship. Mock-up to comply with the following requirements, using materials indicated for the completed Work:
 - 1. Perform mock-up in the location and of the size indicated or, if not indicated, as directed by Architect. Mock-ups shall include, but not limited to the following cast-concrete application and condition:
 - a. New concrete floor slab, minimum 3 feet by 3 feet area.

1.7 FIELD CONDITIONS

- A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

1.8 WARRANTY

- A. The certified installer shall provide a 10-year written labor and material warranty for the floor polishing portion of the work, stating that the concrete will be remain sealed, hardened and dustproof.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General: Polished concrete surfaces shall match Architect's control reference sample. Installer is responsible for coordinating concrete mix designs, placement, finishing procedures and any other concrete related items impacting finishing for concrete floors to receive polished concrete finishing.

- B. Polish Level: Provide polished concrete surfaces meeting the following criteria, as determined by Concrete Sawing and Drilling Assoc. (CSDA) standard CSDA-ST-115 Measuring Concrete Micro Surface Texture:
 - 1. Surface Texture Grade (STG): B-2; 32 microinches (μ in).
 - 2. Surface Grade: Low Polish.
 - 3. Final Grit: 800 grit.
- C. Aggregate Level: Provide polished concrete surfaces meeting the following criteria, as determined by Concrete Polishing Assoc. of America. (CPAA) standard:
 - 1. Class B: 1/16-inch approximate depth of cut.
 - 2. Fine Aggregate; Fine aggregate exposure with little or no medium aggregate exposure at random locations; "Salt and Pepper +" appearance as approved by Architect.
- D. Clarity and Gloss: Provide polished concrete surfaces meeting the following criteria, as determined by Concrete Polishing Assoc. of America. (CPAA) standard:
 - 1. Reflective Clarity: Distinctness of Image (DOI) less than 50 as tested per ASTM D5767.
 - 2. Reflective Sheen (Gloss): 40-50 as tested per ASTM D523.
- E. Slip-Resistance: Polishing process shall result in a slip-resistant floor surface meeting the following coefficient of friction as tested in accordance with applicable ANSI standards:
 - 1. Average Static Coefficient of Friction (SCOF), ANSI B101.1: Minimum 0.60.
 - 2. Average Dynamic Coefficient of Friction (DCOF), ANSI B101.3: Minimum 0.42.

2.2 MANUFACTURERS

- A. Approved Manufacturers:
 - 1. Retro Plate Concrete Polishing System distributed by Curecrete Distribution, Inc.; www.retroplatesystem.com.
 - 2. Consolideck system by Prosoco, Inc.; www.prosoco.com.
 - 3. Induroshine System by W.R. Meadows; www.wrmeadows.com.
 - 4. Scofield, a div. of Sika Corporation; www.scofield.com.
 - 5. Or approved substitution.

2.3 LIQUID FLOOR TREATMENTS

- A. General:
 - 1. Products shall not trigger or contribute to surface Alkali Silicate Reaction (ASR).
 - 2. Indoor Air Quality: Manufacturer shall provide a Healthy Product Declaration (HCD) for each product required for the Work, issued by the Health Product Declaration Collaborative (HPDC).
- B. Installation of reactive co-polymerizing solids (RCS), waterborne solution of inorganic materials that are odorless, colorless that penetrates, hardens, and densifies concrete surfaces when applied at time of refinement and polishing.

2.4 ACCESSORY MATERIALS

- A. Expansion and Isolation Joint Filler: ASTM D4819 Type II, 1/2-inch thick closed cell polyethylene backer rod.
- B. Joint Sealant: As specified in Section 07 92 00 "Joint Sealants".

- C. Repair Material: Patching compound utilizing multiple concrete binders with on-site color matching capabilities, sample accepted by Architect.

PART 3 - EXECUTION

3.1 PREPERATION

- A. Prior to starting work identify floor flatness tolerances of slab in each area where diamond polish finish is required and verify compliance with requirements in Section 03 30 00 "Cast-in-Place Concrete". Correct areas that deviate beyond specified tolerance until they are brought into compliance.
 - 1. Utilize grout mortar forced into the pore structure of the concrete substrate to fill cracks and surface imperfections
 - 2. Provide coordination with subsequent work to ensure finished concrete is without damage and deterioration at Substantial Completion.
- B. Joints: Coordinate joint location and installation with work of Section 03 30 00 "Cast-in-Place Concrete"; provide for joint treatments as work of this Section.
 - 1. Utilize compressible joint filler to fill joints to prevent the infiltration of debris and provide support for sealants applied to the exposed surface; refer to Section 07 92 00 "Joint Sealants" for requirements.

3.2 POLISHING

- A. Apply penetrating liquid floor treatment to cured and prepared slabs to match approved mock-up.
- B. Machine grind floor surfaces to receive polished finishes level and smooth and to depth required to reveal aggregate to match approved mock-up.
- C. 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.
- D. Continue polishing with diamond polishing pads to gloss level, to match approved mock-up.
 - 1. Provide edge polishing at floor and ramp perimeters and stair treads and risers.
 - 2. Control and dispose of waste products produced by grinding and polishing operations.
 - 3. Neutralize and clean polished floor surfaces.
- E. Apply liquid floor sealer to ground, treated and polished slabs to match approved mock-up.

3.3 CLEANING AND PROTECTION

- A. Clean and protect floor finishes from damage.
- B. Perform final cleaning according to liquid treatment system manufacturer's instructions. Record cleaning and Ra measurement in maintenance log.
- C. Train Owner's maintenance personnel on baseline Ra and on cleaning and maintaining RCS polished concrete floors. Document attendees and training.
- D. Prepare and deliver maintenance log to Owner's Representative.

END OF SECTION

SECTION 03 45 00 - PRECAST ARCHITECTURAL CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Architectural precast concrete stair tread units.
 - 2. Delegated design.
- B. Related Requirements:
 - 1. Section 03 30 00 "Cast-in-Place Concrete" for installing connection anchors in concrete.
 - 2. Section 05 12 00 "Structural Steel Framing" for furnishing and installing connections attached to steel stair framing.
 - 3. Section 05 50 00 "Metal Fabrications" for miscellaneous steel shapes.

1.3 DEFINITIONS

- A. Design Reference Sample: Sample of approved architectural precast concrete color, finish and texture, preapproved by Architect.

1.4 PREINSTALLATION MEETINGS

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

1.5 SUBMITTALS

- A. Product Data: For each type of product.
- B. Design Mixtures: For each precast concrete mixture. Include compressive strength and water-absorption tests.
- C. Shop Drawings:
 - 1. Detail fabrication and installation of architectural precast concrete units.
 - 2. Indicate locations, plans, elevations, dimensions, shapes, and cross sections of each unit.
 - 3. Indicate type, size, and length of welded connections by AWS standard symbols. Detail loose and cast-in hardware and connections.
 - 4. Indicate locations, tolerances, and details of anchorage devices to be embedded in or attached to other construction.
 - 5. Indicate relationship of architectural precast concrete units to adjacent materials.
 - 6. Indicate size, location and materials for all composite accessories cast-in panels, including insulation, blocking and nailers used in panel construction.
 - 7. 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: Submit two 3-inch wide by full depth samples of each type of stair tread unit to show the full range of color and texture of treads and integral detectable warning stripes, for selection and approval. If sealer is to be applied to stair tread surfaces, apply sealer on one sample.
- E. Qualification Data: For Installer fabricator.
- F. Welding certificates.
- G. Material Certificates: For the following items:
 - 1. Cementitious materials.
 - 2. Reinforcing materials and prestressing tendons.
 - 3. Admixtures.
 - 4. Bearing pads.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A precast concrete erector qualified and designated by PCI's Certificate of Compliance to erect Category A (Architectural Systems) for non-load -bearing members.
- B. Fabricator Qualifications: A firm that assumes responsibility for engineering architectural precast concrete units to comply with performance requirements. This responsibility includes preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.
- C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D.1.1M, "Structural Welding Code - Steel"; and AWS D1.4/D1.4M, "Structural Welding Code - Reinforcing Steel."
- D. Mockups: After sample panel approval but before production of architectural precast concrete units, construct full-sized mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and to set quality standards for materials and execution.
 - 1. Subject to compliance with requirements, approved mockups may become part of the completed Work if undamaged at time of Substantial Completion.

1.7 COORDINATION

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

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver architectural precast concrete units in such quantities and at such times to limit unloading units temporarily on the ground or other rehandling.
- 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 manner that avoids excessive stresses that cause cracking or damage.
- F. Lift and support units only at designated points indicated on Shop Drawings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Fabricator: Northwest Precast; www.nw-precast.com.
- B. Other Approved Fabricators:
 - 1. Arcis, Corp., and Altusgroup Co.; www.arcispanel.com.
 - 2. Diamond Design Precast, Inc.; www.ddpconcrete.com.
 - 3. Stepstone Inc.; www.stepstoneinc.com.
 - 4. Or approved substitution.

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 61 16 "Delegated Design Requirements," to design architectural precast concrete units.
- 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 architectural precast concrete units indicated.
- C. Structural Performance: Provide architectural precast concrete units and connections capable of withstanding the following design loads within limits and under conditions indicated:
 - 1. Loads: As indicated.
 - 2. Design and fabricate precast concrete units and connections to maintain clearances at openings, to allow for fabrication and construction tolerances, to accommodate live-load deflection, shrinkage and creep of primary building structure, and other building movements as follows:
 - a. Upward and downward movement of 1/8 inch.
 - 3. Thermal Movements: Provide for in-plane thermal movements resulting from annual ambient temperature changes of 120 deg F.

2.3 MOLD MATERIALS

- A. Molds: Rigid, dimensionally stable, non-absorptive material, warp and buckle free, that provides 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 form-release agent that does not bond with, stain or adversely affect precast concrete surfaces and does not impair subsequent surface or joint treatments of precast concrete.
- B. Surface Retarder: Chemical set retarder, capable of temporarily delaying final hardening of newly placed concrete mixture to depth of reveal specified.

2.4 REINFORCING MATERIALS

- A. Reinforcing Bars: ASTM A615/A615M, Grade 60, deformed.
- B. Low-Alloy-Steel Reinforcing Bars: ASTM A706/A706M, deformed.
- C. Steel Bar Mats: ASTM A184/A184M, fabricated from ASTM A615/A615M, Grade 60 ASTM A706/A706M, deformed bars, assembled with clips.
- D. Plain-Steel Welded Wire Reinforcement: ASTM A185/A185M, fabricated from as-drawn galvanized-steel wire into flat sheets.
- E. Deformed-Steel Welded Wire Reinforcement: ASTM A497/A497M, flat sheet.

- F. Supports: Suspend reinforcement from back of mold or use bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place according to PCI MNL 117.

2.5 CONCRETE MATERIALS

- A. Portland Cement: ASTM C150/C150M, Type I or Type III, gray, unless otherwise indicated.
 - 1. For surfaces exposed to view in finished structure, use gray or white cement, of same type, brand, and mill source.
- B. Normal-Weight Aggregates: Except as modified by PCI MNL 117, ASTM C33/C33M, 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.
- C. 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.
- D. Air-Entraining Admixture: ASTM C260, certified by manufacturer to be compatible with other required admixtures.
- E. 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 C494/C494M, Type A.
 - 2. Retarding Admixture: ASTM C494/C494M, Type B.
 - 3. Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type D.
 - 4. Water-Reducing and Accelerating Admixture: ASTM C494/C494M, Type E.
 - 5. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
 - 6. High-Range, Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type G.
 - 7. Plasticizing Admixture: ASTM C1017/C1017M, Type I.
 - 8. Plasticizing and Retarding Admixture: ASTM C1017/C1017M, Type II.
 - 9. Corrosion Inhibiting Admixture: ASTM C1582/C1582M.

2.6 STEEL CONNECTION MATERIALS

- A. Carbon-Steel Shapes and Plates: ASTM A36/A36M.
- B. Carbon-Steel-Headed Studs: ASTM A108, AISI 1018 through AISI 1020, cold finished, AWS D1.1/D1.1M, Type A or Type B, with arc shields and with minimum mechanical properties of PCI MNL 117, Table 3.2.3.
- C. Carbon-Steel Plate: ASTM A283/A283M, Grade C.
- D. High-Strength, Low-Alloy Structural Steel: ASTM A572/A572M.
- E. Deformed-Steel Wire or Bar Anchors: ASTM A496/A496M or ASTM A706/A706M.
- F. Carbon-Steel Bolts and Studs: ASTM A307, Grade A or ASTM F1554, Grade 36; carbon-steel, hex-head bolts and studs; carbon-steel nuts, ASTM A563; and flat, unhardened steel washers, ASTM F844.
- G. High-Strength Bolts and Nuts: ASTM A325, Type 1, heavy hex steel structural bolts; heavy hex carbon-steel nuts, ASTM A563; and hardened carbon-steel washers, ASTM F436.

- H. Zinc-Coated Finish: For exterior steel items and items indicated for galvanizing, apply zinc coating by hot-dip process according to ASTM A123/A123M or ASTM A153/A153M.
 - 1. For steel shapes, plates, and tubing to be galvanized, limit silicon content of steel to less than 0.03 percent or to between 0.15 and 0.25 percent or limit sum of silicon and 2.5 times phosphorous content to 0.09 percent.
 - 2. Galvanizing Repair Paint: High-zinc-dust-content paint with dry film containing not less than 94 percent zinc dust by weight and complying with DOD-P-21035B or SSPC-Paint 20.
- I. Shop-Primed Finish: Prepare surfaces of nongalvanized steel items, except those surfaces to be embedded in concrete, according to requirements in SSPC-SP 3 and shop-apply lead- and chromate-free, rust-inhibitive primer, complying with performance requirements in MPI 79 according to SSPC-PA 1.
- J. Welding Electrodes: Comply with AWS standards.

2.7 BEARING PADS

- A. Provide one of the following bearing pads for architectural precast concrete units as recommended by precast fabricator for application:
 - 1. Elastomeric Pads: AASHTO M 251, plain, vulcanized, 100 percent polychloroprene (neoprene) elastomer, molded to size or cut from a molded sheet, Type A durometer hardness of 50 to 70, ASTM D2240, minimum tensile strength 2250 psi, ASTM D412.
 - 2. High-Density Plastic: Multimonomer, nonleaching, plastic strip.

2.8 ACCESSORIES

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

2.9 GROUT MATERIALS

- A. Nonmetallic, Nonshrink Grout: Packaged, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, plasticizing and water-reducing agents, complying with ASTM C1107/C1107M, Grade A for drypack and Grades B and C for flowable grout and of consistency suitable for application within a 30-minute working time. Water-soluble chloride ion content less than 0.06 percent by weight of cement when tested according to ASTM C1218/C1218M.

2.10 CONCRETE MIXTURES

- A. Prepare design mixtures for each type of precast concrete required.
 - 1. Use a single design mixture for units with more than one major face or edge exposed.
 - 2. Mix Design Color: Manufacturer's standard "Natural Gray".
- B. Limit use of fly ash and ground granulated blast-furnace slag to 20 percent of portland cement by weight; limit metakaolin and silica fume to 10 percent of portland cement by weight.
- C. Design mixtures may be prepared by a qualified independent testing agency or by qualified precast plant personnel at architectural precast concrete fabricator's option.
- D. 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 C1218/C1218M.
- E. Normal-Weight Concrete Mixtures: Proportion face mixtures face and backup mixtures full-depth mixture face and backup mixtures or full-depth mixtures, at fabricator's option 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.
- F. Water Absorption: 6 percent by weight or 14 percent by volume, tested according to ASTM C642, except for boiling requirement.
- G. 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.
- H. When included in design mixtures, add other admixtures to concrete mixtures according to manufacturer's written instructions.

2.11 MOLD FABRICATION

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

2.12 FABRICATION

- A. Cast-in Anchors, Inserts, Plates, Angles, and Other Anchorage Hardware: Fabricate anchorage hardware with sufficient anchorage and embedment to comply with design requirements. Accurately position for attachment of loose hardware, and secure in place during precasting operations. Locate anchorage hardware where it does not affect position of main reinforcement or concrete placement.
 1. Weld-headed studs and deformed bar anchors used for anchorage according to AWS D1.1/D1.1M and AWS C5.4, "Recommended Practices for Stud Welding."
- B. Furnish loose hardware items including steel plates, clip angles, seat angles, anchors, dowels, cramps, hangers, and other hardware shapes for securing architectural precast concrete units to supporting and adjacent construction.
- C. Cast-in reglets, slots, holes, and other accessories in architectural precast concrete units as indicated on the Contract Drawings.
- D. Reinforcement: Comply with recommendations in PCI MNL 117 for fabricating, placing, and supporting reinforcement.
 1. Clean reinforcement of loose rust and mill scale, earth, and other materials that reduce or destroy the bond with concrete. When damage to epoxy-coated reinforcing exceeds limits specified in ASTM A775/A775M, repair with patching material compatible with coating material and epoxy coat bar ends after cutting.
 2. Accurately position, support, and secure reinforcement against displacement during concrete-placement and consolidation operations. Completely conceal support devices to prevent exposure on finished surfaces.
 3. Place 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.

4. Install welded wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh spacing and wire tie laps, where required by design. Offset laps of adjoining widths to prevent continuous laps in either direction.
- E. Reinforce architectural precast concrete units to resist handling, transportation, and erection stresses and specified in-place loads.
- F. 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.
- G. Place concrete in a continuous operation to prevent cold joints or planes of weakness from forming in precast concrete units.
- H. 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 voids 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." Ensure adequate bond between face and backup concrete, if used.
- I. Comply with PCI MNL 117 for hot- and cold-weather concrete placement.
- J. Identify pickup points of architectural precast concrete units and orientation in structure with permanent markings, complying with markings indicated on Shop Drawings. Imprint or permanently mark casting date on each architectural precast concrete unit on a surface that does not show in finished structure.
- K. 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.
- L. Discard and replace architectural precast concrete units that do not comply with requirements, including structural, manufacturing tolerance, and appearance, unless repairs meet requirements in PCI MNL 117 and Architect's approval.

2.13 FABRICATION TOLERANCES

- A. Fabricate architectural precast concrete units to shapes, lines, and dimensions indicated so each finished unit complies with PCI MNL 117 product tolerances as well as position tolerances for cast-in items.
- B. Position Tolerances: For cast-in items measured from datum line location, as indicated on Shop Drawings.
 1. Weld Plates: Plus or minus 1 inch.
 2. Inserts: Plus or minus 1/2 inch.
 3. Handling Devices: Plus or minus 3 inches.
 4. Reinforcing Steel and Welded Wire Reinforcement: Plus or minus 1/4 inch where position has structural implications or affects concrete cover; otherwise, plus or minus 1/2 inch.

2.14 FINISHES

- A. Exposed faces shall be free of joint marks, grain, and other obvious defects. Corners, including false joints shall be uniform, straight, and sharp. Finish exposed-face surfaces of architectural

precast concrete units to match approved design reference sample panels mockups and as follows:

1. Design Reference Sample: Insert description and identify fabricator and code number of sample.
2. PCI's "Architectural Precast Concrete - Color and Texture Selection Guide," of plate numbers indicated.
3. As-Cast Surface Finish: Provide manufacture's standard honed finish; provide acid-etched treatment at nosing as approved by Architect.
 - a. Provide surfaces to match approved sample for acceptable surface, air voids, sand streaks, and honeycomb.
- B. Finish exposed top surfaces of architectural precast concrete units with smooth, steel-trowel finish.
- C. Finish unexposed surfaces of architectural precast concrete units with as cast finish or form liner.

2.15 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, ASTM C1610/C1610M, ASTM C1611/C1611M, ASTM C1621/C1621M, and ASTM C1712.
- B. Owner will employ an independent testing agency to evaluate architectural precast concrete fabricator's quality-control and testing methods.
 1. Allow Owner's testing agency access to material storage areas, concrete production equipment, concrete placement, and curing facilities. Cooperate with Owner's testing agency and provide samples of materials and concrete mixtures as may be requested for additional testing and evaluation.
- C. Strength of precast concrete units is considered deficient if units fail to comply with ACI 318 requirements for concrete strength.
- D. Patching: If core test results are satisfactory and precast concrete units comply with requirements, clean and dampen core holes and solidly fill with precast concrete mixture that has no coarse aggregate, and finish to match adjacent precast concrete surfaces.
- E. Defective Units: Discard and replace recast architectural concrete units that do not comply with acceptability requirements in PCI MNL 117, including concrete strength, manufacturing tolerances, and color and texture range. Chipped, spalled, or cracked units may be repaired, subject to Architect's approval. Architect reserves the right to reject precast units that do not match approved samples, sample panels, and mockups. Replace unacceptable units with precast concrete units that comply with requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting structural frame or foundation and conditions for compliance with requirements for installation tolerances, bearing surface tolerances, and other conditions affecting performance of the Work.
- B. Do not install precast concrete units until supporting cast-in-place concrete has attained minimum allowable design compressive strength and supporting steel or other structure is structurally ready to receive loads from precast concrete units.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install clips, hangers, bearing pads, and other accessories required for connecting architectural precast concrete units to supporting members and backup materials.
- B. Erect architectural precast concrete level, plumb, and square within specified allowable tolerances. Provide temporary supports and bracing as required to maintain position, stability, and alignment of units until permanent connections are completed.
- C. Welding: Comply with applicable requirements in AWS D1.1/D1.1M and AWS D1.4/D1.4M for welding, welding electrodes, appearance, quality of welds, and methods used in correcting welding work.
- D. At bolted connections, use lock washers, tack welding, or other approved means to prevent loosening of nuts after final adjustment.
 - 1. Where slotted connections are used, verify bolt position and tightness. For sliding connections, properly secure bolt but allow bolt to move within connection slot.
- E. Grouting or Dry-Packing Connections and Joints: Grout connections where required or indicated. Retain flowable grout in place until hard enough to support itself. Alternatively, pack spaces with stiff dry-pack grout material, tamping until voids are completely filled. Place grout and finish smooth, level, and plumb with adjacent concrete surfaces. Promptly remove grout material from exposed surfaces before it affects finishes or hardens. Keep grouted joints damp for not less than 24 hours after initial set.

3.3 ERECTION TOLERANCES

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

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections and prepare test reports.
- B. Visually inspect field welds and test according to ASTM E165 or to ASTM E709 and ASTM E1444. High-strength bolted connections are subject to inspections.
- C. Testing agency will report test results promptly and in writing to Contractor and Architect.
- D. Repair or remove and replace work where tests and inspections indicate that it does not comply with specified requirements.
- E. Additional testing and inspecting, at Contractor's expense, shall be performed to determine compliance of replaced or additional work with specified requirements.

3.5 REPAIRS

- A. Repair architectural precast concrete units if permitted by Architect. Architect reserves the right to reject repaired units that do not comply with requirements.
- B. Mix patching materials and repair units so cured patches blend with color, texture, and uniformity of adjacent exposed surfaces and show no apparent line of demarcation between original and repaired work, when viewed in typical daylight illumination from a distance of 20 feet.
- C. Prepare and repair damaged galvanized coatings with galvanizing repair paint according to ASTM A780/A780M.
- D. Wire brush, clean, and paint damaged prime-painted components with same type of shop primer.
- E. Remove and replace damaged architectural precast concrete units when repairs do not comply with requirements.

3.6 CLEANING

- A. Clean surfaces of precast concrete units exposed to view.
- B. Clean mortar, plaster, fireproofing, weld slag, and other deleterious material from concrete surfaces and adjacent materials immediately.
- C. Clean exposed surfaces of precast concrete units after erection and completion of joint treatment to remove weld marks, other markings, dirt, and stains.
 - 1. Perform cleaning procedures, if necessary, according to precast concrete fabricator's recommendations. 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

SECTION 03 54 13 - GYPSUM CEMENT UNDERLAYMENT

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. Nonstructural, self-leveling, gypsum cement underlayment for application below interior floor coverings.
 - 2. Acoustical/ sound mat.
- B. Related Requirements:
 - 1. Section 06 16 00 "Sheathing" for subflooring preparation for substrates to receive gypsum underlayment materials.
 - 2. Section 07 92 00 "Joint Sealants".
 - 3. Section 09 29 00 "Gypsum Board" for coordination of installation at wall base at floors to receive gypsum underlayment.

1.3 PREINSTALLATION MEETINGS

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

1.4 SUBMITTALS

- A. General: Ensure that requests for substitution have been provided to the Architect and that the Architect has provided clear approval of the proposed substitution products prior to order placement, delivery and installation of products.
- B. Product Data: For each type of product.
- C. Shop Drawings: Include plans indicating substrates, locations, and average depths of underlayment based on survey of substrate conditions.
- D. UL Directory Design Assemblies. Refer to Drawings for assembly requirements.
- E. Acoustical Data: Sound assembly testing indicating compliance with indicated requirements. Refer to Drawings for assembly requirements.
- F. Qualification Data: For Installer.
- G. Warranty: Sample warranty.
- H. Warranty.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Installer who is approved by manufacturer for application of underlayment products required for this Project.
- B. Adhesives for flooring installed on gypsum underlayments shall be USG XL Brands. Contractor shall coordinate requirements for warranty.

1.6 FIELD CONDITIONS

- A. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ventilation, ambient temperature and humidity, and other conditions affecting underlayment performance.
 - 1. Place gypsum cement underlayments only when ambient temperature and temperature of substrates are between 50 and 80 deg F (10 and 27 deg C).

1.7 WARRANTY

- A. Warranty: Manufacturer's warranty in which Manufacturer agrees to repair or replace underlayments and materials used that fail in materials within specified warranty period, where installed following manufacturer's instructions. Materials shall be free from defects and meet all performance requirements.
 - 1. Warranty covers installation of the following, when installed in system using manufacturer's recommended adhesive for flooring products above assembly:
 - a. USG Durock X2 Primer-Sealer.
 - b. USG SAM-N25 Sound Reduction Mat.
 - c. USG Levelrock 2500 Green Floor Underlayment.
 - 2. Warranty Period: Ten (10) years.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.
 - 2. UL L593, 1-hour fire rating.
 - 3. UL L505, L511, L536 or L541, 2-hour fire rating.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.
- C. IIC-Rated Assemblies: For IIC-rated assemblies, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 492 and classified according to ASTM E 989 by an independent testing agency.

2.2 MANUFACTURERS

- A. Source Limitations for Gypsum Cement Underlayment: Obtain gypsum cement underlayment materials, primers, and accessories from single source or materials approved by underlayment manufacturer.
- B. Basis-of-Design Manufacturer: USG Corp.; www.usg.com.

2.3 PRODUCTS

- A. Basis-of-Design Product, Underlayment: Levelrock 2500 by USG.
- B. Water: Potable and at a temperature of not more than 70 deg F (21 deg C).
- C. Basis-of-Design Product, Primer-Sealer: Durock X2 Primer-Sealer by USG.

- D. Corrosion-Resistant Coating: Recommended in writing by underlayment manufacturer for metal substrates.
- E. Surface Sealer: Designed to reduce porosity as recommended by manufacturer for type of floor covering to be applied to underlayment.
 - 1. Basis-of-Design Product: Refer to Primer-Sealer above.
- F. Sand Aggregate: ASTM C33, as recommended by manufacturer.

2.4 ACCESSORIES

- A. Acoustical Mat, Resilient Underlayment: Entangled polymeric filament mat attached to water-resistant fabric
 - 1. Basis-of-Design Product: SAM-N25 Sound Attenuation Mat by USG.
- B. Crack Isolation Membrane: Mat for installation under acoustical mat for use in tile assemblies.
 - 1. Basis-of-Design Product: Levelrock Crack Suppression Mat by USG.
- C. Wall Isolation: Provide at wall base and penetrations at floors receiving gypsum underlayment, and as recommended by underlayment manufacturer in writing.
 - 1. Basis-of-Design Product: Levelrock Perimeter Isolation Strips by USG.
- D. Repair: Provide after underlayment cures and dries, as recommended by manufacturer, to patch damaged and uneven surfaces.
 - 1. Basis-of-Design Product: Ultraflow Floor Patch by USG; high polymer-modified cement.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for conditions affecting performance of the Work.
 - 1. Fill cracks and voids in subfloor where leakage could occur using products approved by manufacturer.
- B. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Prepare and clean substrate according to manufacturer's written instructions.
 - 1. Treat nonmoving substrate cracks according to manufacturer's written instructions to prevent cracks from telegraphing (reflecting) through underlayment.
 - 2. Fill substrate voids to prevent underlayment from leaking.
- B. Wood Substrates: Mechanically fasten loose boards and panels to eliminate substrate movement and squeaks. Sand to remove coatings that might impair underlayment bond and remove sanding dust.
 - 1. Apply primer over prepared substrate at manufacturer's recommended spreading rate.
- C. Install perimeter isolation strips at all walls where underlayment abuts at base, and around all penetrations. Comply with manufacturer's installation details.
- D. Adhesion Tests: After substrate preparation, test substrate for adhesion with underlayment according to manufacturer's written instructions.

- E. Sound Control Mat: Install sound control materials according to manufacturer's written instructions.
 - 1. Do not install mechanical fasteners that penetrate through the sound control materials.

3.3 APPLICATION

- A. General: Mix and apply underlayment components according to manufacturer's written instructions.
 - 1. Close areas to traffic during underlayment application and for time period after application recommended in writing by manufacturer.
 - 2. Coordinate application of components to provide optimum adhesion to substrate and between coats.
 - 3. At substrate expansion, isolation, and other moving joints, allow joint of same width to continue through underlayment.
 - 4. Install as accordance with ASTM F 2419.
- B. Apply primer over prepared substrate at manufacturer's recommended spreading rate.
- C. Apply underlayment to produce uniform, level surface.
 - 1. Apply a final layer without aggregate to product surface.
 - 2. Apply to 1-inch thickness, or depth indicated.
- D. Cure underlayment according to manufacturer's written instructions. Prevent contamination during application and curing processes.
- E. Remove and replace underlayment areas that evidence lack of bond with substrate, including areas that emit a "hollow" sound when tapped.
- F. Repair damaged surfaces with patching compound.
- G. Apply surface sealer at rate recommended by manufacturer.
- H. Do not install floor coverings over underlayment until after time period recommended in writing by underlayment manufacturer. Coordinate with Work of other Sections.

3.4 PROTECTION

- A. Protect underlayment from concentrated and rolling loads for remainder of construction period.

END OF SECTION

SECTION 04 22 00 - CONCRETE UNIT MASONRY

PART 1 GENERAL

1.1 SECTION SCOPE

- A. Concrete masonry units.
- B. Mortar and grout.

1.2 DESIGN REQUIREMENTS

- A. Furnish, place, and finish concrete unit masonry and accessories in accordance with design and code requirements.

1.3 RELATED SECTIONS

- A. Section 03 20 00– Concrete Reinforcing.
- B. Section 03 30 00– Cast-in-Place Concrete
- C. See also non-structural specifications.

1.4 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.
- B. Unless otherwise noted, standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes as of the date of issue of these Specifications.
- C. Referenced Standards:
 - 1. California Building Code (2019)
 - 2. ASTM C90 – Standard Specification for Loadbearing Concrete Masonry Units.
 - 3. ASTM C129 – Standard Specification for Non-Loadbearing Concrete Masonry Units.
 - 4. ASTM C140 – Standard Test Methods for Sampling and Testing of Concrete Masonry Units.
 - 5. ASTM C144 – Standard Specification for Aggregate for Masonry Mortar.
 - 6. ASTM C270 – Standard Specification for Mortar for Unit Masonry.
 - 7. ASTM C404 – Standard Specification for Aggregates for Masonry Grout.
 - 8. ASTM C476 – Standard Specification for Grout for Masonry.

1.5 SUBMITTALS

- A. General: Submit as noted below and per division 1.
- B. Certified Mix Designs for mortar and grout: As required per Structural sheet SN.1.
- C. Shop Drawings: As required per Structural sheet SN.1.
- D. Suppliers Certificate indicating units comply with material standards below.

- E. Samples: Submit product samples when requested by Architect or testing laboratory.

1.6 QUALITY ASSURANCE

- A. Materials: Masonry units, Portland cement, lime, connectors, mortar, grout and reinforcement per CBC 2102.2.
- B. Quality: Tests per CBC 2105.
- C. Inspection: Inspections per Structural sheet SN.1, CBC Chapter 17, and building jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Unload masonry units carefully and store on raised platform protected from weather.
- B. Protect cementitious materials against exposure to moisture.
- C. Do not place unit masonry when temperature is below 40 degrees F. When temperature is above 99 degrees F protect masonry from direct exposure to sun and wind.

PART 2 PRODUCTS

2.1 CONCRETE MASONRY UNITS

- A. All blocks shall conform to ASTM C90.
- B. Hollow Load Bearing Units: Shall conform to applicable code per design criteria, Grade N, light-weight, with 1900psi minimum design compressive strength.
- C. Provide open and closed-end units, bond beams, U-Beams, half units, and additional special shapes and sizes as required to complete work.
- D. Block Type:
 - 1. Faces and ends exposed on the exterior shall be "smooth face", 8x8x16.
 - 2. Caps shall be "smooth face", 1-1/2x8x16.
 - 3. Units which are concealed on all surfaces may be either integral color or natural color, and shall have smooth faces.

2.2 MORTAR AND GROUT

- A. Portland Cement: Type II conforming to ASTM C150.
- B. Aggregate:
 - 1. All aggregate shall be sharp, clean, well-graded, and free of injurious amounts of dust, shale, alkali, surface coatings and organic matter.
 - 2. For Mortar: Shall conform to ASTM C144 except that not less than 3% of the sand shall pass the number 100 sieve.
 - 3. For Grout: Shall conform to ASTM C404, Table 1, coarse aggregate.
- C. Water: Clean and potable, free from impurities detrimental to mortar and grout.
- D. Admixtures: Shall not be used unless approved by Engineer and not adversely affecting bond or compressive strength.

2.3 REINFORCEMENT

- A. Reinforcing Steel: See Concrete Reinforcing Section 03 20 00.
- B. Wire Ties: No. 16 annealed wire for tying reinforcing steel.

2.4 ACCESSORIES

- A. Provide spacers to firmly hold reinforcement in place.
- B. Wire Joint Reinforcement: 9 gauge continuous wire in joint.

2.5 MIXES AND MIXING

A. Mortar:

1. Mortar shall be proportioned to meet the requirements of CBC Chapter 21 and ASTM C 270 for Type M mortar.
2. Minimum 2500psi compressive strength at 28 days.
3. Mortar shall be mixed for a minimum of 3 minutes and a maximum of 10 minutes.
4. Use and place mortar in final position within 2½ hours after initial mixing water has been added to the dry ingredients. Mortars may be retempered during that time period but may not be used if it has stiffened due to hydration of the cement.

B. Grout:

1. Grout shall conform to the requirements of ASTM C476 and shall have a minimum compressive strength of 2000psi at 28 days. Cement content of the grout shall be increased as required to achieve the specified masonry assembly strength and adequate workability. When the grout compressive strength is tested it shall equal or exceed the concrete masonry unit strength.
2. Proportions: Grout shall be proportioned as specified by one of the following methods:
 - a. Based on laboratory or field experience with the grout ingredients and the masonry units to be used.
 - b. Minimum compressive strength which will produce the required prism strength.
 - c. Proportions by grout type shall be used as given in CBC Chapter 21.
3. Grout shall be mixed for a minimum of 3 minutes and a maximum of 10 minutes.
4. Grout may not be used if it has stiffened due to hydration of the cement.

2.6 SOURCE QUALITY CONTROL

- A. Owner shall employ a testing laboratory accepted by Engineer to perform the following, when required per plans:
 1. Test masonry units for strength in accordance with ASTM C40.
 2. Review mix designs for mortar and grout.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive masonry and verify the following:
 - 1. That foundation surface is level to permit bed joint with range of $\frac{1}{4}$ " to $\frac{3}{4}$ ".
 - 2. That edge is true to line to permit projection of masonry to less than $\frac{1}{4}$ ".
 - 3. That projecting dowels are free from loose scale, dirt, concrete, or other bond-inhibiting substances and properly located.
- B. Do not begin work before unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean concrete surfaces to receive masonry. Remove laitance or other foreign material lodged in surfaces by sandblasting or other means as required.
- B. Ensure masonry units are clean and free from dust, dirt, or other foreign materials before laying.
- C. Establish lines, levels, and coursing. Protect from disturbances.
- D. Provide temporary bracing during erection of masonry work. Maintain in place until masonry has set to provide permanent bracing.

3.3 COURSING

- A. Erect masonry in accordance with CBC Chapter 21.
- B. Place masonry to lines and levels indicated to the following tolerances:
 - 1. Variation from Unit to Adjacent Unit: $\frac{1}{32}$ " max.
 - 2. Variation from Plane of Wall: $\frac{1}{4}$ " in 10 feet.
 - 3. Variation from Plumb: $\frac{1}{4}$ " in 10 feet.
 - 4. Variation from Level Coursing: $\frac{1}{8}$ " in 3 feet; $\frac{1}{4}$ " in 10 feet; $\frac{1}{2}$ " maximum.
 - 5. Variation of Joint Thickness: $\frac{1}{8}$ " in 3 feet.
- C. Bond: Unless noted otherwise in Drawings, lay concrete masonry units in running bond with vertical joints located over center of unit in course below.
- D. Maintain masonry courses to uniform width. Make vertical and horizontal joints equal and of uniform thickness.
- E. Preserve the vertical continuity of cells in concrete unit masonry. The minimum clear horizontal dimensions of vertical cores shall be 3" x 3" for 8" wide block.

3.4 PLACING AND BONDING

- A. Do not install cracked, broken or chipped concrete masonry units.
- B. Lay only dry concrete masonry units.

- C. Lay masonry in full bed of mortar, properly jointed with other work. Buttering corners of joints, and deep or excessive furrowing of mortar joints are not permitted.
- D. Full bond intersections and external and internal corners.
- E. Do not shift or tap concrete masonry units after mortar has taken initial set. Where adjustment must be made, remove mortar and replace.
- F. Remove excess mortar.
- G. Perform jobsite cutting with proper tools to provide straight unchipped edges. Take care to prevent breaking masonry unit corners or edges.

3.5 JOINTS

- A. Horizontal and vertical joints at concrete masonry units shall be 3/8" wide and as follows:
 - 1. Point joint tight in masonry below ground.
 - 2. All end joints shall be fully filled with mortar and joints squeezed tight. Slushing of mortar into joints shall not be permitted. Mortar in bed joints shall be held back approximately 1/2" from cell to provide positive bond with grout.
 - 3. Joints shall be struck flush where drawings indicate the surface is to be covered with cement, plaster, or stucco.

3.6 MASONRY REINFORCEMENT

- A. Place reinforcement in accordance with ACI 315, to a tolerance of +/- 1/2" from specified location.
- B. Reinforcing steel shall not be bent or straightened in a manner that will injure the material. Bars with kinks or bends not shown on plans shall not be used. Heating of bars for bending will not be permitted.
 - 1. Bars shall conform accurately to the sizes, shapes, lines and dimensions shown on drawings and with hooks and bends made as detailed. Bars shall be placed as indicated on the drawings and centered on grout space.
 - 2. At the time grout is placed around it, reinforcing steel shall be clean of mill scale or other coatings that will destroy or reduce bond.
 - 3. All vertical reinforcing steel shall be installed in one piece, full height of wall, and braced throughout its height in a manner that will retain the steel in proper position and provide proper clearance.

3.7 GROUTING

- A. General Requirements:
 - 1. All cells shall be grouted solid.
 - 2. Use low lift grouting.
 - 3. Use grout pump, hopper or bucket to place grout.
 - 4. Place grout in final position within 1 1/2 hours after introduction of mixing water.

5. Place grout and rod with a $\frac{3}{4}$ " flexible cable vibrator sufficiently to cause it to flow into all voids between the cells and around the reinforcing steel. Slushing with mortar will not be permitted.
 6. Stop grout approximately $1\frac{1}{2}$ " below top of last course; except at top course bring grout to top of wall.
- B. Prior to grouting, the grout space shall be cleaned so that all spaces to be filled with grout do not contain mortar projections greater than $\frac{1}{2}$ ", mortar dropping or other debris.
 - C. Units may be laid to the full height of the grout pour and grout shall be placed in a continuous pour in grout lifts not exceeding 4'.
 - D. Provide clean out holes at the bottom of every pour in cells containing vertical reinforcement. Cleanouts shall be located on concealed faces of wall and shall be sealed after inspection and before grouting.
 - E. When cleanouts are not provided, special provisions must be made to keep the bottom and sides of the grout spaces, as well as the minimum total clear area as required by CBC Chapter 21, clean and clear prior to grouting.

3.8 JOINTS

- A. See drawings for type and location of joints.

3.9 BOND BEAMS

- A. Bond beams shall be located where shown and detailed on the drawings and shall be reinforced as indicated.

3.10 BUILT-IN WORK

- A. Miscellaneous Embedded Items: All items indicated to be embedded in masonry shall be located and anchored to prevent movement during grouting operations. Avoid cutting and patching.
 1. Install all anchor bolts and anchors furnished under other sections.

3.11 CUTTING AND FITTING

- A. Cut and fit for weep holes, pipes, and miscellaneous penetrations. Provide correct size, shape and location.
- B. Obtain approval prior to cutting or fitting any area not indicated or where appearance or strength of masonry work may be impaired.

3.12 REPAIR, POINTING, AND CLEANING

- A. Remove and replace masonry units which are loose, chipped, broken, stained or otherwise damaged, or if units do not match adjoining units.
- B. Pointing: During the tooling of joints, enlarge any voids or holes and completely fill with mortar.
- C. Dry brush masonry surface after mortar has set, at end of each day's work and after final pointing.
- D. Leave work and surrounding surface clean and free of mortar spots and droppings.

- E. Cleaning: Upon completion of masonry installation, repair all holes. Defective joints shall be cut out and rejoined. Exposed masonry surfaces shall be cleaned free of mortar, green stain and efflorescence.

3.13 FIELD QUALITY CONTROL

- A. Testing Service: Owner will select and pay for independent testing agency.
 - 1. When required the independent testing agency will provide the following checks as:
 - a. Measurement and mixing of field mixed mortar and grout.
 - b. Moisture conditions of masonry units at time of laying.
 - c. Observation of laying of units with special attention to joints and bonding of units at corners.
 - d. Proper placement of reinforcement including splices, clearances and supports.
 - e. Observation of placement of pipes, conduits, or weakening elements.
 - f. Inspection of grout spaces immediately prior to grouting for removal of mortar fins, dirt, and debris.
 - g. Continuous observation of grout placement with attention to procedure to avoid segregation and achieve proper consolidation.
 - h. Perform or supervised sampling for testing.

END OF SECTION

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SECTION 05 31 00 - STEEL DECKING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel deck.

B. Related Requirements:

1. Section 05 12 00 "Structural Steel Framing" for deck support framing.
2. Section 05 50 00 "Metal Fabrications" for framing deck openings with miscellaneous steel shapes.
3. Structural General Notes on Drawings.

1.2 SUBMITTALS

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

B. Shop Drawings:

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

C. Welding certificates.

D. Product Certificates: For each type of steel deck. Provide manufacturer's certificate of compliance with design requirements. Comply with SDI Specifications and Commentary, Publication No. 29.

E. 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.

F. Research Reports: For steel deck, from ICC-ES.

G. Field quality-control reports.

1.3 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E329 for testing indicated.

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

1.4 DELIVERY, STORAGE, AND HANDLING

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

B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 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. Fire-Resistance Ratings: Comply with ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 DECKING

- A. Fabricate panels, to comply with applicable specification for type required in SDI Publication No. 31 as follows:
 - 1. Non-composite Form Deck: "SDI Specifications and Commentary for Non-composite Steel Form Deck."
- A. Decking shall comply with the following:
 - 1. Galvanized-Steel Sheet: ASTM A653/A653M, Structural Steel (SS):
 - 2. Grade: As indicated.
 - 3. Coating: G90 zinc coating or equivalent; as indicated.
 - 4. Deck Profile, Depth, Thickness and Laps: As indicated on Structural Drawings.

2.3 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. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.
- D. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength and thickness and of same material and finish as deck; of profile indicated or required for application.
- E. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength and thickness and of same material and finish as deck, and of thickness and profile indicated or as recommended by SDI Publication No. 31 for conditions indicated.
- F. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck unless otherwise indicated.
- G. Weld Washers: Uncoated steel sheet, shaped to fit deck rib, thickness indicated, with factory-punched hole of 3/8-inch minimum diameter, or as required for weld size indicated.
- H. Galvanizing Repair Paint: ASTM A780, SSPC-Paint 20 or MIL-P-21035B, with dry film containing a minimum of 94 percent zinc dust by weight.

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.

3.3 ROOF-DECK INSTALLATION

- A. Fasten roof-deck panels to steel supporting members as indicated on Drawings.
 - 1. Mechanically Fastened: Of fastener type and pattern indicated.
 - 2. Welded, arc spot puddle welds:
 - a. Weld Diameter: 5/8 inch, nominal unless otherwise indicated.
 - b. Weld Spacing: Space welds as indicated.
 - c. Weld Washers: Install weld washers at each weld location.
- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports as indicated.
- C. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld or mechanically fasten] to substrate to provide a complete deck installation.
 - 1. Weld cover plates at changes in direction of roof-deck panels unless otherwise indicated.
- D. 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.

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections. Reference Statement of Special Inspections within the Structural Drawings.
- 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.

3.5 PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A780 and manufacturer's written instructions.
- B. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 05 50 00 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

1. Steel framing and supports for storefront where framing and supports are not specified in other Sections.
2. Steel framing and supports for countertops.
3. Steel framing and supports for mechanical and electrical equipment.
4. Loose bearing and leveling plates for applications where they are not specified in other Sections.
5. Slotted channel framing for re-configurable structures.
6. Metal bollards.
7. Exterior canopy.
8. Deferred submittals for delegated design items.

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

1. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete.
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 01 61 16 "Delegated Design Requirements".
2. Section 03 30 00 "Cast-in-Place Concrete" for installing anchor bolts, steel pipe sleeves, slotted-channel inserts, wedge-type inserts, and other items cast into concrete.
3. Section 05 12 00 "Structural Steel Framing" for coordination requirements; other structural steel fabrications.

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 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. Deliver such items to Project site in time for installation.

1.4 SUBMITTALS

- A. Product Data: For the following:

1. Nonslip aggregates and nonslip-aggregate surface finishes.

2. Prefabricated building columns.
 3. Metal nosings at stairs.
 4. Paint products.
 5. Grout.
- B. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide Shop Drawings for all items specified in this Section, including but not limited to all items indicated in "Summary" Article above.
- C. Samples for Verification: For each type and finish of extruded nosing.
- D. Qualification Data: For professional engineer.
- E. Welding certificates.
- F. 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. 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 A36/A36M.
- D. Channels, Angles, and S-Shapes: ASTM A36/A36M or ASTM A572/A572M, Grade 36.
- E. Rolled-Stainless-Steel Floor Plate: ASTM A793.
- F. Abrasive-Surface Floor Plate: Steel plate with abrasive granules rolled into surface or with abrasive material metallically bonded to steel.
- G. Plate and Bar: ASTM A36/A36M or ASTM A572/A572M, Grade 50.
- H. Steel Tubing: ASTM A500/A500M, cold-formed steel tubing.
- I. Steel Pipe: ASTM A53/A53M, Standard Weight (Schedule 40) unless otherwise indicated.

- J. Zinc-Coated Steel Wire Rope: ASTM A741.
 - 1. Wire-Rope Fittings: Hot-dip galvanized-steel connectors with capability to sustain, without failure, a load equal to minimum breaking strength of wire rope with which they are used.
- K. 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 or other manufacturer standard sizes as indicated or as required per delegated design.
 - 2. Material: Galvanized steel, ASTM A653/A653M, structural steel, Grade 33, with G90 coating; 0.079-inch nominal thickness.
 - 3. Material: Cold-rolled steel, ASTM A1008/A1008M, structural steel, Grade 33; 0.0677-inch minimum thickness; hot-dip galvanized after fabrication.
 - 4. Basis-of-Design Manufacturer: Unistrut, div. of Atkore International, Inc.; www.unistrut.us.
 - 5. Other Approved Manufacturers:
 - a. Cooper B-Line, Inc., div. of Cooper Industries; www.cooperindustries.com.
 - b. Hilti, Inc.; www.hilti.com.
 - c. Powerstrut, div. of Atkore International, Inc.; www.power-strut.com.
- L. Cast Iron: Either gray iron, ASTM A48/A48M, or malleable iron, ASTM A47/A47M, unless otherwise indicated.
- M. Aluminum Plate and Sheet: ASTM B209, Alloy 6061-T6.
- N. Aluminum Extrusions: ASTM B221, Alloy 6063-T6.
- O. Aluminum-Alloy Rolled Tread Plate: ASTM B632/B632M, Alloy 6061-T6.
- P. Aluminum Castings: ASTM B26/B26M, Alloy 443.0-F.

2.3 FASTENERS

- A. General: Unless otherwise indicated, provide Type 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
 - 1. Provide stainless-steel fasteners for fastening aluminum.
 - 2. Provide stainless-steel fasteners for fastening stainless steel.
- B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A; with hex nuts, ASTM A563; and, where indicated, flat washers.
- C. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A325, Type 3; with hex nuts, ASTM A563, Grade C3; and, where indicated, flat washers.
- D. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F593; with hex nuts, ASTM F594; and, where indicated, flat washers; Alloy Group 2.
- E. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A563; and, where indicated, flat washers.
 - 1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.
- F. Anchors, General: Anchors capable of sustaining, without failure, four times the load imposed when installed in concrete, as determined by testing according to ASTM E488/E488M, conducted by a qualified independent testing agency.
- G. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A47/A47M malleable iron or

ASTM A27/A27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F2329.

- H. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.
 - 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941, Class Fe/Zn 5, unless otherwise indicated.
 - 2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 2 stainless-steel bolts, ASTM F593, and nuts, ASTM F594.
- I. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 7/8 inches by length indicated with anchor straps or studs not less than 3 inches long at not more than 8 inches o.c. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B633, Class Fe/Zn 5, as needed for fastening to inserts.
- J. High-Strength Bolts, Nuts, and Washers: ASTM A325, Type 1, heavy-hex steel structural bolts; ASTM A563, Grade C, heavy-hex carbon-steel nuts; and ASTM F436, Type 1, hardened carbon-steel washers; all with plain finish.
 - 1. Direct-Tension Indicators: ASTM F959, Type 325, compressible-washer type with plain finish.
- K. Zinc-Coated High-Strength Bolts, Nuts, and Washers: ASTM A325, Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH heavy-hex carbon-steel nuts; and ASTM F436, Type 1, hardened carbon-steel washers.
 - 1. Finish: Hot-dip or mechanically deposited zinc coating.
 - 2. Direct-Tension Indicators: ASTM F959, Type 325, compressible-washer type with mechanically deposited zinc coating, baked epoxy-coated finish.

2.4 MISCELLANEOUS MATERIALS

- A. Shop Primers: Provide primers that comply with Section 09 91 00 "Painting" and Section 09 96 00 "High-Performance Coatings."
- B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
 - 1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- C. Water-Based Primer: Emulsion type, anticorrosive primer for mildly corrosive environments that is resistant to flash rusting when applied to cleaned steel, complying with MPI#107 and compatible with topcoat.
- D. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.
- E. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.
- F. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- G. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.
- H. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- I. Concrete: Comply with requirements in Section 03 30 00 "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 3000 psi.
- J. Welding Electrodes: Comply with AWS requirements.

2.5 GROUT

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

2.6 FABRICATION, GENERAL

- 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 A6/A6M 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. 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.
- D. 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.
- E. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- F. Form exposed work with accurate angles and surfaces and straight edges.
- G. 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.
- H. 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.
- I. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- J. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- K. 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.

- L. Where units are indicated to be cast into concrete, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.7 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
- B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
 - 1. Fabricate units from slotted channel framing where indicated.
 - 2. Furnish inserts for units installed after concrete is placed.
- C. Fabricate supports for operable and stationary components from continuous steel beams of designed sizes or as recommended by partition manufacturer with attached bearing plates, anchors, and braces as indicated or recommended by partition manufacturer. Drill or punch bottom flanges of beams to receive partition track hanger rods; locate holes where indicated on components' Shop Drawings. Provide supports for the following as required:
 - 1. For overhead sectional door support framing.
 - 2. For aluminum-framed curtainwall and storefronts without support framing.
 - 3. For structured-polycarbonate-panel assembly support framing.
- D. Galvanize miscellaneous framing and supports where indicated.
- E. Prime miscellaneous framing and supports with zinc-rich primer where indicated.

2.8 SHELF ANGLES AND LOOSE LINTELS

- A. Fabricate shelf angles and loose lintels 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 shelf angles 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 concrete.
- C. Galvanize and prime shelf angles located in exterior walls.
- D. Prime shelf angles located in exterior walls with zinc-rich primer.
- E. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.

2.9 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 construction.
- C. Galvanize and prime exterior miscellaneous steel trim.

- D. Prime miscellaneous steel trim with zinc-rich primer.

2.10 LOOSE BEARING AND LEVELING PLATES

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

2.11 LOOSE STEEL LINTELS

- A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in 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 and prime loose steel lintels located in exterior walls.
- D. Prime loose steel lintels located in exterior walls with zinc-rich primer.

2.12 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.

2.13 METAL BOLLARDS

- A. Standard Stationary Bollards: Fabricate metal bollards from Schedule 80 steel, as indicated.
 - 1. Diameter: 6-in., or as indicated.
 - 2. Cap bollards with 1/4-inch-thick, steel plate with flat top.
 - 3. Avoid use of baseplates. Where required, provide as follows:
 - a. 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.
 - b. Where bollards are to be anchored to sloping concrete slabs, angle baseplates for plumb alignment of bollards.
 - 4. Fabricate sleeves for bollard anchorage from steel pipe 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.
 - 5. Fill with concrete; 3,000 psi; coordinate with Section 03 30 00 "Cast-in-Place Concrete".
 - 6. Prime steel bollards with primer specified in Section 09 96 00 "High-Performance Coatings."

2.14 EXTERIOR CANOPY

- A. General: Provide Structural steel shapes for frame and brackets for canopy framing as indicated.
 - 1. Refer to Structural Drawings for requirements.
 - 2. Comply with Section 05 12 00 "Structural Steel Framing."
 - 3. Steel shall be free from twists, kinks, warping, gouges, and other imperfections.

- B. Fabricate canopy framing to the fullest extents in shop.
 - 1. Oversize weld sizes to accommodate finishing indicated.
 - 2. Orient tube steel to conceal seam welds on face. Indicate seam location for review in shop drawings.
 - 3. Welding: At exposed faces, finish welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
 - 4. Fabricate channel for edge of canopy and channel trim for building façade in same profile, as indicated. Formed channel profile shall match with no greater than 1/32-inch between height and depth indicated.

- C. Erection: Erect to tolerances specified in AISC 303.

2.15 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.

2.16 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.
 - 1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
- B. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, unless otherwise indicated.
 - 1. Shop prime with universal shop primer unless zinc-rich primer is indicated.
- C. Preparation for Shop Priming: Prepare surfaces to comply with requirements indicated below:
 - 1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 3. Items Indicated to Receive Primers Specified in Section 09 96 00 "High-Performance Coatings": SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 4. Other Items: SSPC-SP 3, "Power Tool Cleaning."
- D. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
 - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

2.17 ALUMINUM FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
 - 1. High-Performance Organic Finish: Two- or three-coat fluoropolymer finish complying with AAMA 2604 or AAMA 2605 and containing not less than 70 percent PVDF or FEVE resin

by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturer's written instructions.

a. Approved Fluoropolymer Resin Products:

- 1) Hylar 5000 by Solvay; www.solvay.com.
- 2) Kynar 500 by Arkema: www.kynar500.com.

b. Approved Finish Coating Products:

- 1) Duranar XL Coil Coating by PPG IdeaScapes; www.ppgideascales.com.
- 2) Fluoropon Classic Coil Coating by Valspar Corp., div. of The Sherwin-Williams Co.; www.valsparcoilextrusion.com.

2. Color: Clear anodized.

- 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 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. Verify, with certified steel erector present, elevations of concrete-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.

3.3 PREPARATION, STEEL PANEL FACING

- A. Preparation of components indicated to receive clear powder coat finish:
1. Provide finish to the steel fabrications and all associated fasteners and accessories.
 2. Remove or blend tool and die marks and stretch lines into finish.
 3. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.
- B. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean

3.4 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-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 except as approved by Architect on a case-by-case basis. 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.

3.5 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A325 or A490 Bolts" for type of bolt and type of joint specified.
 - 1. Joint Type: Snug tight unless noted otherwise on Structural Drawings.
- 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, 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.

3.6 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 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 or similar construction.
- F. Corrosion Protection: Coat concealed surfaces of aluminum that come into contact with grout, concrete, wood, or dissimilar metals with the following:
 - 1. Extruded Aluminum: Two coats of clear lacquer.

3.7 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. Support steel girders on solid grouted concrete or steel pipe columns. Secure girders with anchor bolts embedded in concrete or with bolts through top plates of pipe columns.
 - 1. Where grout space under bearing plates is indicated for girders supported on concrete, install as specified in "Installing Bearing and Leveling Plates" Article.
- C. 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.

3.8 INSTALLING BEARING AND LEVELING PLATES

- A. Clean concrete 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.

3.9 FIELD QUALITY CONTROL, STEEL

- A. Special Inspections: Where required, Owner will engage a qualified special inspector to perform the following special inspections noted below. Also reference requirements of structural drawings

and Statement of Special Inspections within the structural drawings for all required inspections and testing in addition to this specification.

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 bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A325 or A490 Bolts."
- D. Welded Connections: Visually inspect field welds according to 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 E165.
 - b. Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
 - c. Ultrasonic Inspection: ASTM E164.
 - d. Radiographic Inspection: ASTM E94.

3.10 FIELD QUALITY CONTROL, METAL POWDER COAT FINISHED ITEMS

- A. Inspection: Examine painted items for defective materials and workmanship, as determined by the Architect.
1. Inspect coated surfaces to ensure that areas have not been missed during finishing.
 2. Repair missed areas in the coating.
- B. Appearance:
1. Finished surfaces must be uniform in thickness and color;
 2. Finished surfaces must be smooth and free from blemishes in the coating that might impair the serviceability or detract from the general appearance of the member when viewed from 10 feet away under normal lighting conditions; and match approved samples, as determined by the Architect.

3.11 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. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 09 91 00 "Painting."
- C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION

SECTION 05 51 16 - METAL FLOOR PLATE STAIRS

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. Stairs with steel floor plate treads.
 - 2. Steel railings and guards attached to metal stairs.
- B. Related Requirements:
 - 1. Section 01 61 16 "Delegated Design Requirements".
 - 2. Section 09 96 00 "High-Performance Coatings" for coordination of primers with coating system.

1.3 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorages for metal stairs, railings, and guards.
 - 1. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, blocking for attachment of wall-mounted handrails, and items with integral anchors, that are to be embedded in concrete or masonry.
 - 2. Deliver such items to Project site in time for installation.
- C. Coordinate locations of hanger rods and struts with other work so they do not encroach on required stair width and are within fire-resistance-rated stair enclosure.
- D. Schedule installation of railings and guards so wall attachments are made only to completed walls.
 - 1. Do not support railings and guards temporarily by any means that do not satisfy structural performance requirements.

1.4 ACTION SUBMITTALS

- A. Product Data: For metal floor plate stairs and the following:
 - 1. Metal floor plate treads.
 - 2. Shop primer products.
 - 3. Grout.
- B. Shop Drawings:
 - 1. Include plans, elevations, sections, details, and attachments to other work.
 - 2. Indicate sizes of metal sections, thickness of metals, profiles, holes, and field joints.
 - 3. Include plan at each level.

4. Indicate locations of anchors, weld plates, and blocking for attachment of wall-mounted handrails.
- C. Delegated-Design Submittal: For stairs, railings, and guards, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For professional engineer's experience with providing delegated-design engineering services of the kind indicated, including documentation that engineer is licensed in the State in which Project is located.
- B. Welding certificates.
- C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.
- B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.7 DELIVERY, STORAGE, AND HANDLING

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design stairs, railings, and guards, including attachment to building construction.
- 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 and guard loads in addition to loads specified above.
 5. Limit deflection of treads, platforms, and framing members to L/360.

- C. Structural Performance of Railings and Guards: Railings and guards, 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.
 - 3. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
 - a. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
- D. Seismic Performance of Stairs: Metal stairs shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 - 1. Component Importance Factor: 1.5.

2.2 METALS

- A. Metal Surfaces: Provide materials with smooth, flat surfaces unless otherwise indicated. For components exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
- C. Rolled-Steel Floor Plate: ASTM A786/A786M, rolled from plate complying with ASTM A36/A36M or ASTM A283/A283M, Grade C or D.
- D. Abrasive-Surface Floor Plate: Steel plate with abrasive granules rolled into surface or with abrasive material metallurgically bonded to steel.
- E. Steel Tubing for Railings and Guards: ASTM A500/A500M (cold formed) or ASTM A513/A513M.
 - 1. Provide galvanized finish for exterior installations and where indicated.
- F. Steel Pipe for Railings and Guards: ASTM A53/A53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.
 - 1. Provide galvanized finish for exterior installations and where indicated.
- G. Cast Iron: Either gray iron, ASTM A48/A48M, or malleable iron, ASTM A47/A47M, unless otherwise indicated.

2.3 FASTENERS

- A. General: Provide zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 12 for exterior use, and Class Fe/Zn 5 where built into exterior walls.
 - 1. Select fasteners for type, grade, and class required.
- B. 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 E488/E488M, conducted by a qualified independent testing agency.

1. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F593, and nuts, ASTM F594.

2.4 MISCELLANEOUS MATERIALS

- A. Welding Electrodes: Comply with AWS requirements.
- B. Shop Primers: Provide primers that comply with Section 09 96 00 "High-Performance Coatings."
- C. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
 1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- D. Zinc-Rich Primer: Comply with SSPC-Paint 20, Type II, Level 2, and compatible with topcoat.
- E. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.
- F. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- G. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107/C1107M, factory-packaged, nonmetallic aggregate grout; recommended by manufacturer for exterior use; noncorrosive and nonstaining; mixed with water to consistency suitable for application and a 30-minute working time.

2.5 FABRICATION, GENERAL

- A. Provide complete stair assemblies, including metal framing, hangers, railings, guards, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.
 1. Join components by welding unless otherwise indicated.
 2. Use connections that maintain structural value of joined pieces.
- B. Assemble stairs, railings, and guards in shop to greatest extent possible.
 1. Disassemble units only as necessary for shipping and handling limitations.
 2. Clearly mark units for reassembly and coordinated installation.
- C. Cut, drill, and punch metals cleanly and accurately.
 1. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated.
 2. Remove sharp or rough areas on exposed surfaces.
- D. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- E. Form exposed work with accurate angles and surfaces and straight edges.
- F. Weld connections to comply with the following:
 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 2. Obtain fusion without undercut or overlap.
 3. Remove welding flux immediately.
 4. Weld exposed corners and seams continuously unless otherwise indicated.

5. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #4 - Good quality, uniform undressed weld with minimal splatter.
- G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible.
1. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts unless otherwise indicated.
 2. Locate joints where least conspicuous.
 3. Fabricate joints that will be exposed to weather in a manner to exclude water.
 4. Provide weep holes where water may accumulate internally.

2.6 FABRICATION OF STEEL-FRAMED STAIRS

- A. NAAMM Stair Standard: Comply with NAAMM AMP 510, "Metal Stairs Manual," for Industrial Class, unless more stringent requirements are indicated.
- B. Stair Framing:
1. Fabricate stringers of steel channels.
 - a. Stringer Size: 12 inches.
 - b. Provide closures for exposed ends of channel stringers.
 - c. Finish: Shop or factory-prime painted, gray.
 2. Construct platforms and tread supports of steel channel headers and miscellaneous framing members as required to comply with "Performance Requirements" Article.
 - a. Provide closures for exposed ends of channel framing.
 - b. Finish:
 3. Weld stringers to headers; weld framing members to stringers and headers.
 4. Where stairs are enclosed by gypsum board shaft-wall assemblies, provide hanger rods or struts to support landings from floor construction above or below.
 - a. Locate hanger rods and struts where they do not encroach on required stair width and are within the fire-resistance-rated stair enclosure.
 5. Where masonry walls support metal stairs, provide temporary supporting struts designed for erecting steel stair components before installing masonry.
- C. Metal Floor Plate Stairs: Form treads and platforms to configurations shown from rolled-steel floor plate of thickness needed to comply with performance requirements, but not less than 1/4 inch.
1. Form treads with integral nosing and back edge stiffener. Form risers of same material as treads.
 2. Weld steel supporting brackets to stringers and weld treads to brackets.
 3. Fabricate platforms with integral nosings matching treads and weld to platform framing.
 4. Fabricate treads and platforms of exterior stairs so finished walking surfaces slope to drain.
- D. Risers: Solid.
- E. Toe Plates: Provide toe plates around openings and at edge of open-sided floors and platforms, and at open ends and open back edges of treads.
1. Material and Finish: Match treads and platforms.
 2. Fabricate to dimensions and details indicated.

2.7 FABRICATION OF STAIR RAILINGS AND GUARDS

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

2.8 FINISHES

- A. Finish metal stairs after assembly.
- B. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.
 - 1. Do not quench or apply post-galvanizing treatments that might interfere with paint adhesion.
 - 2. Fill vent and drain holes that will be exposed in finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.
- C. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed products:
 - 1. Exterior Stairs: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 2. Interior Stairs: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 3. 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 EXAMINATION

- A. Verify elevations of floors, bearing surfaces and locations of bearing plates, and other embedments for compliance with requirements.
 - 1. For wall-mounted railings, verify locations of concealed reinforcement within gypsum board and plaster assemblies.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF METAL STAIRS

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction.
 - 1. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.
- C. Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete unless otherwise indicated.
 - 1. Grouted Baseplates: Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces.
 - a. Clean bottom surface of baseplates.

- b. Set steel stair baseplates on wedges, shims, or leveling nuts.
 - c. After stairs have been positioned and aligned, tighten anchor bolts.
 - d. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.
 - e. Promptly pack grout solidly between bearing surfaces and plates to ensure that no voids remain.
 - 1) Neatly finish exposed surfaces; protect grout and allow to cure.
 - 2) Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- E. Fit exposed connections accurately together to form hairline joints.
 - 1. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations.
 - 2. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
 - 3. Comply with requirements for welding in "Fabrication, General" Article.

3.3 INSTALLATION OF RAILINGS AND GUARDS

3.4 REPAIR

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - 1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
- B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 09 96 00 "High-Performance Coatings."
- C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION

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SECTION 05 52 13 - PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Pipe and tube railings and handrails.
 - 2. Delegated design.
- B. Related Requirements:
 - 1. Section 01 61 16 "Delegated Design Requirements".

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 anchorages for handrails. 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 handrails temporarily by any means that do not satisfy structural performance requirements.

1.4 SUBMITTALS

- A. Product Data: For the following:
 - 1. Manufacturer's product lines of mechanically connected handrails.
 - 2. Handrail brackets.
 - 3. Grout, anchoring cement, and paint products.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
- C. Samples: For each type of exposed finish required.
 - 1. Sections of each distinctly different linear handrail member, including handrails, top rails, posts, and balusters.
 - 2. Fittings and brackets.
- D. Delegated-Design Submittal: For handrails indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- E. Qualification Data:
 - 1. For testing agency.
 - 2. For professional engineer.
- F. Welding certificates.

- G. Mill Certificates: Signed by manufacturers of stainless-steel products certifying that products furnished comply with requirements.
 - H. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.
 - I. 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.
 - J. 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 D1.6/D1.6M, "Structural Welding Code - Stainless 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 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 61 16 "Delegated Design Requirements" to design handrails, including attachment to building construction.
- B. Structural Performance: Handrails, 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. (0.73 kN/m) applied in any direction.
 - b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 - 2. Infill of Guards:
 - a. Concentrated load of 50 lbf (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m).
 - b. Infill load and other loads need not be assumed to act concurrently.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
 - 1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C, material surfaces).

2.2 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 (38-mm) clearance from inside face of handrail to finished wall surface.

2.3 STEEL AND IRON

- A. Tubing: ASTM A500 (cold formed) or ASTM A513.
- B. Pipe: ASTM A53/A53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.
 - 1. Provide galvanized finish for exterior installations and where indicated.
- C. Plates, Shapes, and Bars: ASTM A36/A36M.
- D. Cast Iron: Either gray iron, ASTM A48/A48M, or malleable iron, ASTM A47/A47M, unless otherwise indicated.
- E. Woven-Wire Mesh: Intermediate-crimp, woven-wire mesh, made from 0.781-inch- (1.98-mm-) diameter wire complying with ASTM A510 (ASTM A510M).

2.4 FASTENERS

- A. General: Provide the following:
 - 1. Stainless-Steel Handrails: Type 316 stainless-steel fasteners.
 - 2. Provide exposed fasteners with finish matching appearance, including color and texture, of handrails.
- B. Fasteners for Anchoring Handrails to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring handrails to other types of construction indicated and capable of withstanding design loads.
- C. Fasteners for Interconnecting Handrail Components:
 - 1. Provide concealed fasteners for interconnecting handrail components and for attaching them to other work, unless otherwise indicated.
 - 2. Provide concealed fasteners for interconnecting handrail components and for attaching them to other work, unless exposed fasteners are unavoidable or are the standard fastening method for handrails indicated.
 - 3. Provide Phillips, square or hex socket flat-head machine screws for exposed fasteners unless otherwise indicated.
- D. 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. Stainless-steel bolts, ASTM F 593 (ASTM F 738M), and nuts, ASTM F 594 (ASTM F 836M). Provide alloy Group 1 (A1) where Type 304 stainless-steel is required; alloy Group 2 (A4) where Type 316 stainless-steel is required.

2.5 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
 - 1. For stainless-steel handrails, provide type and alloy as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.
- B. 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.
- C. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.
 - 1. Water-Resistant Product: At exterior locations and where indicated provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

2.6 FABRICATION

- A. General: Fabricate handrails 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 handrails 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 (1 mm) 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 handrails 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. Nonwelded Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
 - 1. Fabricate splice joints for field connection using an epoxy structural adhesive if this is manufacturer's standard splicing method.

- J. Form Changes in Direction as Follows:
 - 1. For stainless-steel handrails: As detailed.
- K. 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.
- L. Close exposed ends of handrail members with prefabricated end fittings.
- M. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch (6 mm) or less.
- N. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect handrail 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.
- O. Provide inserts and other anchorage devices for connecting handrails to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by handrails. Coordinate anchorage devices with supporting structure.
- P. For handrail posts set in concrete, provide stainless-steel sleeves not less than 6 inches (150 mm) long with inside dimensions not less than 1/2 inch (13 mm) greater than outside dimensions of post, with metal plate forming bottom closure.

2.7 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. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
 - 4. 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 galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.
- C. Preparing Galvanized Railings for Shop Priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with etching cleaner.
- D. For nongalvanized-steel railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves; however, galvanize anchors to be embedded in exterior concrete or masonry.
- E. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with requirements indicated below:
 - 1. Exterior Railings: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 2. Railings Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 3. Railings Indicated to Receive Primers Specified in Section 09 96 00 "High-Performance Coatings": SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 4. Other Railings: SSPC-SP 3, "Power Tool Cleaning."

- F. 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 that comply with Section 09 91 00 "Painting," and Section 09 96 00 "High-Performance Coatings."
 - 2. Do not apply primer to galvanized surfaces.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION, GENERAL

- A. Fit exposed connections together to form tight, hairline joints.
- B. Perform cutting, drilling, and fitting required for installing handrails. Set handrails 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 handrail 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 (2 mm in 1 m).
 - 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 (6 mm in 3.5 m).
- C. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
- D. Adjust handrails before anchoring to ensure matching alignment at abutting joints.
- E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing handrails and for properly transferring loads to in-place construction.

3.3 HANDRAIL CONNECTIONS

- A. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting handrail components. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of handrails.
- B. Welded Connections: Use fully welded joints for permanently connecting handrail components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.
- C. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches (50 mm) beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6 inches (150 mm) of post.

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. Form or core-drill holes not less than 5 inches (125 mm) deep and 3/4 inch (20 mm) larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.
- C. Cover anchorage joint with flange of same metal as post, attached to post with set screws.
- D. Leave anchorage joint exposed with 1/8-inch (3-mm) buildup, sloped away from post.
- E. Anchor posts to metal surfaces with oval flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:
 - 1. For stainless-steel pipe handrails, weld flanges to post and bolt to supporting surfaces.
- F. Install removable handrail sections, where indicated, in slip-fit metal sockets cast in concrete.

3.5 ATTACHING HANDRAILS

- A. Anchor handrail ends at walls with round flanges anchored to wall construction and welded to handrail ends.
- B. Anchor handrail ends to metal surfaces with flanges bolted to metal surfaces and welded to handrail ends.
- C. Attach handrails to wall with wall brackets, except where end flanges are used. Locate brackets as indicated or, if not indicated, at regular, equal spacing required to support structural loads.

3.6 ADJUSTING AND CLEANING

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

3.7 PROTECTION

- A. Protect finishes of handrails from damage during construction period with temporary protective coverings approved by handrail manufacturer. Remove protective coverings at time of Substantial Completion.

END OF SECTION

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SECTION 05 59 13 - METAL BALCONIES

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. Prefabricated galvanized steel balconies with guardrails.
- B. Related Requirements:
 - 1. Section 09 22 16 "Non-Structural Metal Framing" for metal backing for anchoring balconies.

1.3 DEFINITIONS

- A. Balconies: Prefabricated or site-built platforms that are connected to the side of a building and surrounded by a railing.
- B. Railings: Guards, handrails, and similar devices used for protection of occupants at open-sided floor areas and for pedestrian guidance and support, visual separation, or wall protection.

1.4 COORDINATION AND SCHEDULING

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible.
- B. Coordinate installation of anchorages for balconies. Furnish 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 items to Project site in time for installation.
- C. Schedule installation so wall attachments are made only to completed walls. Do not support balconies temporarily by any means that do not meet structural performance requirements.

1.5 PREINSTALLATION MEETINGS

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

1.6 SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Manufacturer's product lines of prefabricated balconies.
 - 2. Manufacturer's product lines of railings assembled from standard components.
- B. Shop Drawings:
 - 1. Include plans, elevations, sections, and attachment details.
- C. Samples for Initial Selection: For products involving selection of color, texture, or design, including mechanical finishes.
- D. Samples for Verification: For each type of exposed finish required.
 - 1. Sections of each distinctly different linear railing member, including top rails and posts.

2. Fittings and brackets.
 3. Assembled Samples of balcony railing systems, made from full-size components, including top rail, post, handrail, and infill. Show method of finishing members at intersections. Samples need not be full height.
- E. 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.
- 1.7 INFORMATIONAL SUBMITTALS
- A. Qualification Data: For professional engineer.
 - B. Welding certificates.
 - C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, according to ASTM E894 and ASTM E935.
 - D. Preconstruction test reports.
- 1.8 QUALITY ASSURANCE
- A. Welding Qualifications: Qualify procedures and personnel according to the following:
 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- 1.9 PRECONSTRUCTION TESTING
- A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on laboratory mockups. Payment for these services will be made from the testing and inspecting allowance, as authorized by Change Orders. Retesting of products that fail to meet specified requirements shall be done at Contractor's expense.
 1. Build laboratory mockups at testing agency facility; use personnel, materials, and methods of construction that will be used at Project site.
 2. Test railings according to ASTM E894 and ASTM E935.
 3. Notify Architect seven days in advance of the dates and times when laboratory mockups will be tested.
- 1.10 FIELD CONDITIONS
- A. Field Measurements: Verify actual locations of walls and other construction contiguous with balconies by field measurements before fabrication and indicate measurements on Shop Drawings. Field measurements/verifications are to be performed by the installer in the field if required.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design prefabricated balconies.
- B. General: In engineering balconies and railings to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:
 1. Steel: 72 percent of minimum yield strength.

C. Structural Performance:

1. Balcony Platform:

a. Uniform load of 60 lbf/sq. ft.

2. 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:

a. Uniform load of 50 lbf/ft. applied in any direction.

b. Concentrated load of 200 lbf applied in any direction.

c. Uniform and concentrated loads need not be assumed to act concurrently.

3. Railing Infill:

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.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on balconies and railings 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 MANUFACTURERS

A. Source Limitations: Obtain each type of balcony from single source from single manufacturer.

2.3 METAL BALCONIES

A. Prefabricated Galvanized steel Balconies:

1. Fabrication: Preassembled.

2. Railing Posts: Galvanized steel posts; size as indicated.

3. Railing Top Rail: Galvanized steel stock; size as indicated.

4. Finish: Powder coat.

a. Color: As selected by Architect from full range of industry colors and color densities.

5. Attachment Brackets: Provide side-mount mounting brackets.

6. Support Components: Provide stainless steel wire rope and fittings with stainless steel wall and balcony attachment plates.

2.4 DECK

A. Basis-of-Design Product: As selected by Architect.

2.5 MATERIALS, 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: Same metal and finish as supported rails unless otherwise indicated.

1. Provide extruded-aluminum brackets with interlocking pieces that conceal anchorage. Locate set screws on bottom of bracket.

2.6 ALUMINUM

- A. Aluminum, General: Provide alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with strength and durability properties for each aluminum form required not less than that of alloy and temper designated below.
- B. Extruded Bars and Shapes, Including Extruded Tubing: ASTM B221, Alloy 6063-T5/T52.
- C. Drawn Seamless Tubing: ASTM B210, Alloy 6063-T832.
- D. Plate and Sheet: ASTM B209, Alloy 5005-H32 or Alloy 6061-T6.
- E. Die and Hand Forgings: ASTM B247, Alloy 6061-T6.
- F. Castings: ASTM B26/B26M, Alloy A356.0-T6.

2.7 STAINLESS STEEL

- A. Wire Rope and Fittings:
 - 1. Subject to compliance with requirements, provide manufacturer's standard cable product.
 - 2. Wire Rope: 1-by-19 left hand lay wire rope made from wire complying with ASTM A492, Type 316.
 - 3. Wire-Rope Fittings: Connectors of types indicated, fabricated from stainless steel, and with capability to sustain, without failure, a load equal to minimum breaking strength of wire rope with which they are used.

2.8 FABRICATION

- A. Shop Assembly of Preassembled Deck Frames: Assembled deck frames includes front fascia, joists, and subfascia with deck boards not included.

2.9 GENERAL FINISH REQUIREMENTS

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

2.10 ALUMINUM FINISHES

- A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- B. Mechanical Finish: AA-M3x; sand top rails, handrails, and intermediate rails in one direction only, parallel to length of railing, with 120- and 320-grit abrasive. After installation, polish railings with No. 0 steel wool immersed in paste wax, then rub to a luster with a soft, dry cloth.
- C. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm, or AA-M12C22A31, Class II, 0.010 mm or thicker.

- D. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm, or AA-M12C22A32/A34, Class II, 0.010 mm or thicker.
 - 1. Color: As selected by Architect from full range of industry colors and color densities.
- E. Baked-Enamel Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
 - 1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine attachment locations for suitable conditions where balconies will be installed.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's standards and engineering for installation of balconies.

3.3 CLEANING

- A. Clean galvanized steel by washing thoroughly with clean water and soap, rinsing with clean water, and wiping dry.
- B. Clean and polish as recommended in writing by manufacturer. Wash both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion.

3.4 PROTECTION

- A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.
- B. Restore finishes damaged during installation and construction period so no evidence remains of correction work.

END OF SECTION

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SECTION 05 75 00 - DECORATIVE FORMED METAL

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. Closures and trim.
 - 2. Exterior expanded perforated metal shading screen system.
 - 3. Metal frames.
 - 4. Delegated design.
- B. Related Requirements:
 - 1. Section 01 61 16 "Delegated Design Requirements".
 - 2. Section 09 91 00 "Painting" for coordination of preparation and primer.

1.3 COORDINATION

- A. Coordinate installation of anchorages for decorative formed metal items. 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 items to Project site in time for installation.
- B. Coordinate installation of decorative formed metal with adjacent construction to ensure that wall assemblies, flashings, trim, and joint sealants, are protected against damage from the effects of weather, age, corrosion, and other causes of deterioration.

1.4 PREINSTALLATION MEETINGS

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

1.5 SUBMITTALS

- A. Product Data: For each type of product, including finishing materials.
- B. Shop Drawings: Show fabrication and installation details for decorative formed metal.
 - 1. Include plans, elevations, component details, and attachment details.
 - 2. Indicate materials and profiles of each decorative formed metal member, fittings, joinery, finishes, fasteners, anchorages, and accessory items.
- C. Samples for Initial Selection: For products involving selection of color, texture, or design, including mechanical finishes.
- D. Samples for Verification: For each type of exposed finish required, prepared on 6-inch-square Samples of metal of same thickness and material indicated for the Work.
- E. 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.

- F. Coordination Drawings: For decorative formed metal elements that house items specified in other Sections. Show dimensions of housed items, including locations of housing penetrations and attachments, and necessary clearances.
- G. Qualification Data: For Installer, fabricator, organic-coating applicator and professional engineer.
- H. Mill Certificates: Signed by stainless-steel manufacturers certifying that products furnished comply with requirements.
- I. Evaluation Reports: For post-installed anchors, from International Code Council Evaluation Service (ICC-ES).
- J. Maintenance Data: For mirror-like stainless-steel finish to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Fabricator Qualifications: A firm experienced in producing decorative formed metal similar to that indicated for this Project and with a record of successful in-service performance as well as sufficient production capacity to produce required units.
- B. Organic-Coating Applicator Qualifications: A firm experienced in successfully applying organic coatings of type indicated to metals of types indicated and that employs competent control personnel to conduct continuing, effective quality-control program to ensure compliance with requirements.
- C. Anodic Finisher Qualifications: A firm experienced in successfully applying anodic finishes of type indicated and that employs competent control personnel to conduct continuing, effective quality-control program to ensure compliance with requirements.
- D. Powder-Coating Applicator Qualifications: A firm experienced in successfully applying powder coatings of type indicated to metals of types indicated and that employs competent control personnel to conduct continuing, effective quality-control program to ensure compliance with requirements.
- E. Installer Qualifications: Fabricator of products.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver decorative formed metal products wrapped in protective coverings and strapped together in suitable packs or in heavy-duty cartons. Remove protective coverings before they stain or bond to finished surfaces.
- B. Store products on elevated platforms in a dry location.

1.8 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls, columns, beams, and other construction contiguous with decorative formed metal by field measurements before fabrication and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 61 16 "Delegated Design Requirements," to design decorative formed metal, including attachment to building construction.

- B. Structural Performance: Decorative formed metal items, including anchors and connections, shall withstand the effects of gravity loads and the following loads and stresses without exceeding the allowable design working stress of materials involved and without exhibiting permanent deformation in any components:
 - 1. Wind Loads on Exterior Items: As indicated on Drawings.
- C. Seismic Performance: Exterior decorative formed metal items, including anchors and connections, shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 - 1. Component Importance Factor: 1.0.
- D. Thermal Movements: For exterior applications and interior applications adjacent to windows subject to direct sunlight, 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 SHEET METAL

- A. General: Fabricate products from sheet metal without pitting, seam marks, roller marks, stains, discolorations, or other imperfections where exposed to view on finished units.
- B. Laser Cut Metal Screens:
 - 1. Basis-of-Design Product: As selected by Architect.
 - 2. Material, design pattern, and finish: As selected by Architect.
- C. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- D. Aluminum Sheet: Flat sheet complying with ASTM B209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with strength and durability properties of not less than Alloy 5005-H32.
- E. Galvanized-Steel Sheet: ASTM A653/A653M, G90 (Z275) coating, either commercial steel or forming steel.
- F. Steel Sheet, Galvanized: Electrolytic zinc-coated, ASTM A879/A879M, with steel sheet substrate complying with ASTM A1008/A1008M, commercial steel, exposed.
- G. Steel Sheet for Blackened Steel Finish: Hot-rolled, hot-rolled steel sheet, ASTM A36.
- H. Stainless-Steel Sheet: ASTM A240/A240M or ASTM A666, Type 304 at interior locations; Type 316 at exterior locations; stretcher-leveled standard of flatness.

2.3 MISCELLANEOUS MATERIALS

- A. Gaskets: As required to seal joints in decorative formed metal and remain weathertight; as recommended in writing by decorative formed metal manufacturer.
 - 1. ASTM D1056, Type 1, Class A, grade as recommended by gasket manufacturer to obtain seal for application indicated.
 - 2. Closed-cell polyurethane foam, adhesive on two sides, release paper protected.
- B. Sealants, Exterior: Elastomeric sealant complying with Section 07 92 00 "Joint Sealants" and as recommended in writing by decorative formed metal manufacturer.
- C. Sealants, Interior: Nonsag, paintable sealant complying with Section 07 92 00 "Joint Sealants" and as recommended in writing by decorative formed metal manufacturer.

- D. Filler Metal and Electrodes: Provide type and alloy of filler metal and electrodes as recommended by producer of metal to be welded or brazed and as necessary for strength, corrosion resistance, and compatibility in fabricated items.
 - 1. Use filler metals that will match the color of metal being joined and will not cause discoloration.
- E. Fasteners: Fabricated from same basic metal and alloy as fastened metal unless otherwise indicated. Do not use metals that are incompatible with materials joined.
 - 1. Provide concealed fasteners for interconnecting decorative formed metal items and for attaching them to other work unless exposed fasteners are unavoidable or are the standard fastening method.
 - 2. Provide square or hex socket flat-head machine screws for exposed fasteners unless otherwise indicated.
- F. Structural Anchors: For applications indicated to comply with certain design loads, provide fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193 or ICC-ES AC308.
- G. Nonstructural Anchors: For applications not indicated to comply with design loads, provide fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193 or ICC-ES AC308.
- H. Anchor Materials:
 - 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941, Class Fe/Zn 5, unless otherwise indicated.
 - 2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Stainless-steel bolts, ASTM F593, and nuts, ASTM F594; alloy Group 1 (A1) for Type 304 and similar alloys; alloy Group 2 (A4) for Type 316 and similar alloys.
- I. Sound-Deadening Materials:
 - 1. Insulation: Unfaced, mineral-fiber blanket insulation complying with ASTM C665, Type I, and passing ASTM E136 test.
 - 2. Mastic: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.
- J. Backing Materials: Provided or recommended by decorative formed metal manufacturer.
- K. Laminating Adhesive: Adhesive recommended by metal fabricator that will fully bond metal to metal, will prevent telegraphing and oil-canning, and is compatible with substrate and noncombustible after curing.
- L. Isolation Coating: Manufacturer's standard alkali-resistant coating, bituminous paint or epoxy coating.

2.4 PAINTS AND COATINGS

- A. Etching Cleaner for Galvanized Metal: Complying with MPI#25.
- 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. Shop Primers: Comply with Section 09 91 00 "Painting".
- D. Universal Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
 - 1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- E. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.

- F. Shop Primer for Galvanized Steel: Water-based galvanized metal primer complying with MPI#134.
- G. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

2.5 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble decorative formed metal items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- B. Coordinate dimensions and attachment methods of decorative formed metal items with those of adjoining construction to produce integrated assemblies with closely fitting joints and with edges and surfaces aligned unless otherwise indicated.
- C. Form metal to profiles indicated, in maximum lengths to minimize joints. Produce flat, flush surfaces without cracking or grain separation at bends. Fold back exposed edges of unsupported sheet metal to form a 1/2-inch-wide hem on the concealed side, or ease edges to a radius of approximately 1/32 inch and support with concealed stiffeners.
- D. Increase metal thickness or reinforce with concealed stiffeners, backing materials, or both, as needed to provide surface flatness equivalent to stretcher-leveled standard of flatness and sufficient strength for indicated use.
 - 1. Support joints with concealed stiffeners as needed to hold exposed faces of adjoining sheets in flush alignment.
- E. Build in straps, plates, and brackets as needed to support and anchor fabricated items to adjoining construction. Reinforce decorative formed metal items as needed to attach and support other construction.
- F. Provide support framing, mounting and attachment clips, splice sleeves, fasteners, and accessories needed to install decorative formed metal items.
- G. Where welding or brazing is indicated, weld or braze joints and seams continuously. Grind, fill, and dress to produce smooth, flush, exposed surfaces in which joints are not visible after finishing is completed.
 - 1. Use welding and brazing procedures that will blend with and not cause discoloration of metal being joined.
 - 2. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 1 welds: no evidence of a welded joint.

2.6 CLOSURES AND TRIM

- A. Form closures and trim from metal of type and thickness indicated below. Fabricate to fit tightly to adjoining construction, with weathertight joints at exterior installations. Fabricate closures and trim of the following metals to match adjacent components or as indicated; avoid dissimilar metals which can cause galvanic corrosion:
 - 1. Aluminum Sheet: Thickness required to comply with performance requirements.
 - a. Finish: High-performance organic coating.
 - 2. Galvanized-Steel Sheet: Thickness required to comply with performance requirements.
 - a. Finish: Powder coat.
 - 3. Stainless-Steel Sheet: Thickness required to comply with performance requirements.
 - a. Finish: No. 4.

4. Closures and trim may be fabricated from prefinished metal sheet in lieu of finishing after fabrication provided unfinished edges are concealed from view and not exposed to weather.
- B. Conceal fasteners where possible; otherwise, locate where they are as inconspicuous as possible. Size fasteners to support closures and trim, with fasteners spaced to prevent buckling or waviness in finished surfaces.
- C. Drill and tap holes needed for securing closures and trim to other surfaces.
- D. Incorporate gaskets where indicated or needed for concealed, continuous seal at abutting surfaces.
- E. Miter or cope trim members at corners and reinforce with bent metal splice plates to form tight joints.

2.7 FILLER PANELS

- A. Do not provide custom-fabricated filler panels for partition closure at exterior window systems. Refer to Section 09 29 00 "Gypsum Board" for acoustical closures at exterior window systems.

2.8 EXTERIOR EXPANDED PERFORATED METAL SHADING SCREEN SYSTEM

- A. Exterior Expanded Perforated Metal Shading Screen System: Expanded metal screen attached to supporting framework connected to supporting building structure.
 1. Basis-of-Design Manufacturer: BÖK MODERN LLC; www.bokmodern.com.
 - a. Or approved equal.
 2. Framework includes metal U-channel clips direct-attached to building structure using stainless steel anchors, with vertical aluminum extruded tubes connected to channel clips with stainless-steel self-tapping metal screws.
 - a. Finish all sides and faces of expanded perforated metal shading screen, after forming.
- B. Color and Finish: As selected by Architect. All exposed surfaces including but not limited to framework, all surfaces of expanded metal screen, clips and fasteners, shall be finished.

2.9 POCKETS FOR WINDOW TREATMENT

- A. Form pockets from metal of type and thickness indicated below, with end closures. Coordinate dimensions and attachment methods with window treatment equipment, window frames, ceiling suspension system, and other related construction to produce a coordinated, closely fitting assembly. Fabricate pockets of the following metals to match adjacent components or as indicated; avoid dissimilar metals which can cause galvanic corrosion:
 1. Aluminum Sheet: Thickness required to comply with performance requirements and as indicated.
 - a. Finish: High-performance organic coating.
 2. Galvanized-Steel Sheet: Thickness required to comply with performance requirements and as indicated.
 - a. Finish: Powder coat.
 3. Pockets for window treatment may be fabricated from prefinished metal sheet in lieu of finishing after fabrication provided unfinished edges are concealed from view.
- B. Reinforce pockets for attaching window treatment equipment and hardware, or increase metal thickness.

- C. Divide continuous pockets with built-in partitions located to separate adjoining drapery and blind units, to coincide with window mullions, and to receive filler panels at ends of partitions.

2.10 COLUMN COVERS

A. Approved Products:

1. Column Cover System by Americlad/ Quality Metalcrafts, LLC; www.americlad.com.
2. Column Covers by Fry Reglet; www.fryreglet.com.
3. Benchmark Column Covers by Kingspan Group; www.kingspan.com.
4. PAC-1000F Column Cover by Pac-Clad, div. of Carlisle; www.pac-clad.com.
5. Column Covers by SAF Southern Aluminum Finishing Co., Inc.; www.saf.com.

- B. Form column covers to dimensions and diameters as indicated on shop drawings. Column covers shall be self-aligning with attachment clips at 18 in. o.c. to assure solid attachment to post structures. Form radii to achieve true and smooth curves as indicated.

- C. Provide column cover sections of longest single length possible in to align with reveals indicated. Provide additional sections to achieve finished heights while respecting reveals indicated.

- D. Columns covers shall have no exposed fasteners unless specified. Provide additional bracing components as necessary to stiffen substructure and insure solid mid-span bracings and connections.

E. Materials:

1. Aluminum: Aluminum sheet and plate; Type 3003-H14, 5005-H34 (anodized) or 5052-H32 alloy complying with ASTM B209.
 - a. Thickness: Provide one of the following:
 - 1) 0.090 inches.
 - 2) 0.125 inches.
 - b. Finish: Anodized to match aluminum storefront framing.

- F. Joint: Manufacturer's butt-joint.

2.11 GENERAL FINISH REQUIREMENTS

- A. Complete mechanical finishes of flat sheet metal surfaces before fabrication where possible. After fabrication, finish all joints, bends, abrasions, and other surface blemishes to match sheet finish.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Apply organic and anodic finishes to formed metal after fabrication unless otherwise indicated.
- D. Finish after assembly.
- E. 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.

2.12 STEEL SHEET FINISHES

- A. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning," to remove dirt, oil, grease, or other contaminants that could impair paint bond. Remove mill scale and rust,

if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or with SSPC-SP 8, "Pickling."

- B. Pretreatment: Immediately after cleaning, apply a conversion coating of type suited to organic coating.
- C. Factory Priming for Field-Painted Finish: Where field painting after installation is indicated, apply shop primer to prepared surfaces of items unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

2.13 ALUMINUM FINISHES

- A. As-Fabricated Finish: AA-M12.
- B. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.
- C. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.
 - 1. Colors: By Sherwin-Williams Co., The; www.sherwin-williams.com.
 - a. No. 1: SW 7065 "Argos".
 - b. No.3: SW 6753 "Jargon Jade".
 - c. No. 4: SW 6685 "Trinket".
 - d. No. 5: SW 7584 "Red Theatre".

2.14 GALVANIZED-STEEL SHEET FINISHES

- A. Preparing Galvanized Items for Factory Priming: Thoroughly clean galvanized decorative formed metal of grease, dirt, oil, flux, and other foreign matter, and treat with etching cleaner.
- B. Preparing Galvanized Items for Factory Finishing: 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.
- C. Repairing Galvanized Surfaces: Clean welds and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.
- D. Factory Priming for Field-Painted Finish: Where field painting after installation is indicated, apply shop primer to prepared surfaces of items unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

2.15 STAINLESS-STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - 1. Run grain of directional finishes with long dimension of each piece. Indicate grain of directional finishes on shop drawings; confirm approval of grain direction from Architect prior to fabrication.
- C. Directional Satin Finish: No. 4.
- D. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

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 decorative formed metal.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Locate and place decorative formed metal items level and plumb and in alignment with adjacent construction. Perform cutting, drilling, and fitting required to install decorative formed metal.
 - 1. Do not cut or abrade finishes that cannot be completely restored in the field. Return items with such finishes to the shop for required alterations, followed by complete refinishing, or provide new units as required.
- B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where needed to protect metal surfaces and to make a weathertight connection.
- C. Form tight joints with exposed connections accurately fitted together. Provide reveals and openings for sealants and joint fillers as indicated.
- D. Install concealed gaskets, joint fillers, insulation, sealants, and flashings, as the Work progresses, to make exterior decorative formed metal items weatherproof.
- E. Install concealed gaskets, joint fillers, sealants, and insulation, as the Work progresses, to make interior decorative formed metal items soundproof or lightproof as applicable to type of fabrication indicated.
- F. Corrosion Protection: Apply bituminous paint or other permanent separation materials on concealed surfaces where metals would otherwise be in direct contact with substrate materials that are incompatible or could result in corrosion or deterioration of either material or finish.

3.3 ADJUSTING AND CLEANING

- A. Unless otherwise indicated, clean metals by washing thoroughly with water and soap, rinsing with clean water, and drying with soft cloths.
- B. Clean copper alloys according to metal finisher's written instructions in a manner that leaves an undamaged and uniform finish matching approved Sample.
- C. 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. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.
- D. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 09 91 00 "Painting".
- E. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit or provide new units.

3.4 PROTECTION

- A. Protect finishes of decorative formed metal items from damage during construction period. Remove temporary protective coverings at time of Substantial Completion.

END OF SECTION

SECTION 06 10 00 - ROUGH CARPENTRY

PART 1 GENERAL

1.1 SECTION SCOPE

- A. Wood Framing.
- B. Rough Hardware.
- C. Plywood Sheathing.
- D. Preservative Treatment.

1.2 DESIGN REQUIREMENTS

- A. Provide all labor, materials, tools, facilities, and equipment required for the fabrication and installation of rough carpentry and associated items.

1.3 RELATED SECTIONS

- A. Section 03 10 00 – Concrete Forming.
- B. Section 03 30 00– Cast-in-Place Concrete.
- C. Section 06 17 53 – Fabricated Wood Trusses.
- D. Section 06 18 00 – Glued-Laminated Construction.
- E. See also non-structural specifications.

1.4 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.
- B. Unless otherwise noted, standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes as of the date of issue of these Specifications.
- C. Referenced Standards:
 - 1. California Building Code (2019)
 - 2. ASTM A123 – Standard Specification for Zinc Coatings on Iron and Steel Products.
 - 3. ASTM A307 – Standard Specification for Carbon Steel Bolts and Studs.
 - 4. WCLIB Rule 17 – Standard Grading Rules for West Coast Lumber.
 - 5. WWPA – Standard Grading Rules for Western Lumber.
 - 6. RIS – Standard Specifications for Grades of California Redwood Lumber.
 - 7. Plywood – The Engineered Wood Association (APA); Plywood Specifications and Grades.
 - 8. Wood Preservative – American Wood Preservative Association (AWPA).
 - 9. NDS – National Design Specification for Wood Construction.

1.5 SUBMITTALS

- A. General: Submit as noted below and per division 1.
- B. Certification:
 - 1. Pressure Treated Wood: Certification for water-borne preservative that moisture content was reduced to 19% maximum after treatment.

1.6 QUALITY ASSURANCE

- A. Coordinate the work of all trades to ensure proper placement of all materials, anchors, etc., as well as providing for openings and anchors for the installation of surface mounted materials and equipment.
- B. Qualifications of Workmen: Provide sufficient skilled workmen and supervisors who shall be present at all times during execution of this portion of the work and who shall be thoroughly familiar with the type of construction involved and the materials and techniques specified.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protection:
 - 1. After delivery, store all materials off the ground, covered, and in such a manner as to ensure proper ventilation and drainage and to protect against damage and the weather. Maintain wood at the maximum moisture levels indicated in Materials Section.
 - 2. Keep all material clearly identified with all grade marks legible; keep all damaged material clearly identified as damaged, and separately store to prevent its inadvertent use. Do not allow installation of damaged or otherwise non-complying material.
 - 3. Use all means necessary to protect the installed work and materials of all other trades.
- B. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Engineer.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Sawn Lumber:
 - 1. Lumber (Wood Framing): Meet requirements of following minimum grades, unless noted otherwise on plans. All grades to WCLIB Grading Rules #17. Species shall be Douglas-Fir – Coast Region. At time of construction moisture content shall not exceed 19%.
 - a. Wall Studs – as noted on plans.
 - b. Top Plates – #2
 - c. Sills and Plates – Stud grade, sill plates to be pressure treated.
 - d. Rim Joists – as noted on plans.
 - e. 2x and 4x Framing – #2
 - f. 6x and Larger Framing – #1
 - 2. All sawn lumber is assumed to be enclosed in the dry building envelope in the final service condition, unless noted otherwise, and free to dry to moisture content less than 19%.

- B. Wood Sheathing:
 - 1. Roof, Floor and Wall Structural Sheathing: PS1 and PS2 APA rated sheathing with exterior glue. Thickness, type, and grade shall be as indicated on drawings.
- C. Plates, Blocking, Cast-in-Nailers at Concrete Curbs, or Sills on Concrete: Pressure-treated.
- D. Building Paper: For vertical walls surfaces use Fortifiber Jumbo Tex HD 30, or approved equal, waterproof, conforming to Federal Specification UU-B-790a, Type 1, Grade D, Style 2, ASTM F 1249, ASTM D779. Building paper for cement plaster wall surfaces shall be specified in section 9110-Lath and Plaster Substrate.
- E. Waterproof membrane flashing: Waterproof membrane flashing shall be Bituthene or equal.
- F. Preservative Treatment:
 - 1. Per specifications on drawings.
 - 2. Cut, bored or notched surfaces shall be retreated per AWP.
- G. Rough Hardware Fastenings and Connections: All types including bolts, lag screw, nails, spikes, screws, washers and other rough hardware, of kinds that may be purchased and that require no further fabrication, shall be furnished and installed for all finish and rough carpentry. All exterior hardware or hardware installed in pressure treated lumber shall be hot-dipped galvanized to a G-185 rating (per ASTM A653), batch/post hot dipped galvanized (ASTM A123 & A135), mechanically galvanized (ASTM B695), or stainless steel.
 - 1. Common wire nails or spikes unless noted otherwise on the drawings. See required nail dimensions on drawings. Bore holes for nails wherever necessary to prevent splitting. Use finish or casing nails for finish work. Nails for exterior wood trim shall be galvanized. Box nails and sinker nails are not permitted.
 - 2. Bolts: Bolts shall conform to ASTM A307, grade A, Hexagonal heads of sizes indicated. Holes shall be 1/16" larger than bolt diameter. Drive fit with washers under nuts. Malleable or plate washers shall be used where bolt heads or nuts bear on wood. Upset threads are not permitted.
 - 3. Lag bolts: Bolts shall conform to ASTM A307, Grade A, Hexagonal heads, unless noted otherwise. Shall be screwed (not driven) into place. Use galvanized bolts wherever indicated.
 - 4. Washers: Washers for bearing against wood shall be provided under all bolt heads and nuts. Malleable iron or steel plate having as area equal to 16 times the area of bolt or lag screw. Steel washers shall have a thickness not less than 1/10 the length of the washer's longest side. Malleable iron washers shall have a bearing surface for the nut or head equal in diameter to not less than the long diameter of the nut or head.
 - 5. Powder Driven Fasteners: Tempered steel pins with special corrosive resistant plating or coating. Pins shall have guide washers to accurately control penetration. Fastening shall be accomplished by low-velocity piston-driven power activated tool. Pins and tool shall be as manufactured by Hilti Fastening Systems or accepted equal. See Drawings for size, type and embedment. All fasteners shall have ICBO approval.
 - 6. Expansion Bolts: Hilti Fastening Systems "Kwik-Bolt Concrete Expansion Anchors" to concrete or approved equal. Install with minimum edge distance per drawings.
 - 7. Fabricated Metal Timber Framing Connectors: Fabricate from hot-dipped galvanized steel. Connectors shall be punched for nailing and bolting. Nails and nailing shall conform to the manufacturer's instructions with a nail provided for each punched hole. Types as noted on

Drawings. As manufactured by Simpson Strong Tie Co., or approved equal. All connectors must have specific ICBO approval. Do not substitute connectors manufactured by other than Simpson-Strong Tie, without written review by the Structural Engineer. All framing connectors shall be stamped with manufacturer's logo and model designation.

2.2 FABRICATION

A. Lumber:

1. Air or kiln-dry to maximum 19% moisture content at time of installation.
2. Furnish S4S unless otherwise noted.
3. Size to conform to rules of governing standard. Sizes shown are nominal unless noted otherwise.

2.3 SOURCE QUALITY CONTROL

A. Grade mark each piece of lumber. Marking must be done by recognized agency.

1. Douglas Fir shall bear WCLIB grade stamp.
2. Pressure treated Douglas Fir shall bear AWWPA Quality mark.

B. Wood Sheathing: Each panel shall be legibly identified as to type, grade and species by APA grade. If plies are spliced, the slope of the scarf shall not be steeper than 1:8.

PART 3 EXECUTION

3.1 SURFACE CONDITIONS

A. Inspection:

1. Prior to all work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly proceed.
2. Verify that rough carpentry may be performed in strict accordance with the original design and all pertinent codes and regulations.

3.2 WORKMANSHIP

1. All rough carpentry shall produce joints true, tight, and well nailed with all members assembled in accordance with the drawings.
2. Selection of Lumber Pieces: Carefully select all members. Select individual pieces so that knot and defects will not interfere with placing bolts or proper nailed or making proper connections. Discard all defects which will render a piece unable to serve its intended function.
3. Lumber may be rejected by the Engineer, whether or not it has been installed, for excessive warp, twist, bow, crook, mildew, fungus or mold, as well as for improper cutting and fitting.
4. Shimming: Do not shim any framing component.
5. Care shall be taken that notching and boring of members is in strict conformance with the drawings and there are no overcuts.

3.3 FASTENING

A. Nailing: Except as otherwise indicated on drawings or specified, all nailing shall be as required by CBC Table 2304.10.1 Fastening Schedule.

1. Nails or spikes shall be common wire nails unless noted otherwise. Penetration of nails or spikes into the main member shall be (12) times the nail or spike diameter, unless noted otherwise on the drawings.
 - a. Bore holes for nails wherever necessary to prevent splitting. Hole spitting shall not exceed 75% of nail diameter.
 - b. Use finish or casing nails for finish work.
 - c. Use of nailing guns is as limited by CBC. Nails installed with guns shall not penetrate into the outer plies deeper than hand nailing.
- B. Bolts: Bolts shall be of sizes indicated. Holes for bolts shall be 1/16" larger than the bolt. Drive fit with washers under head and nuts. Malleable or plate washers shall be used. Lag screws shall be screwed (not driven) into place with holes bored the same depth and diameter as shank. For threaded portion, holes shall be between 60% and 75% of the shank diameter. Retighten all bolts and screws before closing in.
- C. Framing Devices: As specified under Products, sizes as indicated.

3.4 FRAMING AND ROUGH CARPENTRY

- A. Sills: Shall be in long lengths of sizes shown, fastened with anchor bolts (or MAS or Powder Driven Fasteners as accepted per drawings) as indicated, a minimum of two (2) anchor bolts per piece and a bolt within 12" but not nearer than (7) bolt diameters from end of piece. Place malleable iron or steel plate washers (but not cut washers) under nuts bearing on wood. Set sills level and true.
- B. Studs, Posts and Columns: Shall be full length. Corners shall be as detailed. Partitions or walls containing plumbing, heating or other piping shall be so formed as to give proper clearance for materials. Cut members as required to provide full bearing at ends. Connect to structure as indicated.
- C. Plates: Shall be in long lengths and spliced as shown.
- D. Blocking: Shall be same thickness and width of studs or joists unless shown otherwise. Install fire blocking in accordance with CBC. Install blocking at all plywood joints where noted on the drawings. Install solid blocking at floor joists beneath all posts in walls. Install backing for fastening all exterior and interior surface applied and recessed applied items or at all wall, floor or roof penetrations. Provide backing at all continuous eave vents and all other vents.
- E. Joists and Beams: Shall be in long lengths and spliced over bearings unless shown otherwise. Install with crown side up. Beams or headers indicated to be built up of two or more joists shall be fabricated on the job using full length members. For two piece 2x members, stitch nail pieces together with (3) rows 20d @ 16"oc per SN.1, Section 6.3. Clinch nails protruding through members. For larger piece members, stitch bolt pieces together with 1/2" bolts spaced not over 12"o.c. and staggered.
 1. Provide double joists and headers at all openings through roof unless otherwise shown on drawings.
 2. Provide typical headers at all openings through walls where one or more studs are required to be cut. For penetration through walls narrower than stud spacing, provide solid backing on all sides for fastening finish materials.

- F. Plywood Structural Sheathing: Install to pattern indicated and provide blocking at joints where noted on the drawings. Center all joints over bearing supports. Nail to framing as indicated. Install plywood with face plies perpendicular to joists or studs unless indicated otherwise. Wall plywood sheathing shall continue uninterrupted by ceilings or soffit from floor to roof unless specifically detailed on the drawings. Provide 1/8" gap between all panel joints (except at T&G).
- G. Wood Furring, Stripping, and Grounds: Install as shown or required to provide nailing of materials or passage of pipes, conduits, etc., not otherwise accommodated including ceiling stripping for gypsum drywall construction. Install wood grounds for material as indicated and required.
- H. Bridging: Space not over 8'-0" o.c. for spans over 16'-0". Spans over 8'-0" and under 16'-0" shall have bridging placed at midspan. Bridging shall be solid blocking or as indicated. Joists 8" or less in depth shall not require bridging unless specifically indicated. Drill attic bridging for ventilation as directed by architect.
- I. Solid Wood Backing: Shall be provided for all wall and ceiling finishes and for the supporting and anchorage of products, fixtures and equipment for all trades, including handrails, guardrail brackets, metal toilet partitions, toilet room accessories, frames, cabinets, case work, mirrors, trim, applied wall finishes, athletic equipment, food service equipment, etc. Coordinate placement of backing and supports with manufacturer or supplier of mounted items.
- J. Building Paper: Install per Architect.
- L. Tongue and Groove Decking: Install across framing members. Nail decking as indicated and draw boards up tight.
- M. Framing members shall not be notched or bored unless specifically detailed on the drawings.

3.5 MISCELLANEOUS CARPENTRY WORK

- A. Miscellaneous Carpentry Work not included under other sections shall be furnished and installed hereunder as indicated. Carefully locate and securely anchor items furnished by other trades or under other sections of these specifications to the structure or structural framing.
- B. Drypack: Drypack shall consist of one part high early strength Portland cement to not more than three parts of sand by volume. Add only a minimum amount of water to hold the mixture in shape while packing and to provide hydration. Solidly ram drypack into place to provide uniform bearing and cure with moist sacks or cloths for a period of at least three days.
- C. Wood Curbs for Equipment: Construct all wood curbs for roof mounted equipment as detailed. Provide all miscellaneous blocking, bracing, supports, and other wood items as shown or required to complete the work. Provide all wood framed openings through structural system where pre-fabricated metal curbs, equipment, etc. is to be located on roofs, platforms, through walls, or any other framed component of the structure.
- D. Plywood Backing for Electrical, telephone, and similar types of wall mounted equipment shall be provided hereunder where required. Plywood shall be 3/4" thick exterior A-C plywood with 'A' face exposed.
- E. Fire/Draft Stops: Construct fire and drafts stops in attic spaces where indicated or required by CBC. Construct of not less than 5/8" Type 'X' gypsum wallboard or 1/2" plywood, adequately

supported. Draft stop and installation work shall conform to CBC requirements.

- F. Shoring and Bracing: Shore or brace for temporary support of all work as required during the construction period except any shoring and bracing specified and included under other sections of these specifications.
- G. Temporary Enclosures: Provide and maintain all barricades and enclosures required to protect the work in progress.
- H. Protect all work in progress and all work installed, as well as the work of all other trades. Any work damaged as a result of the work under this section shall be corrected to its original condition or replaced.
- I. Protect preformed metal roofing by approved method should any work be required on roof after roofing installation.

3.6 FRAMING TOLERANCES

- A. Maximum variation from true flatness: $\frac{1}{4}$ " in 10'-0" in any direction.

3.7 CLEAN-UP

- A. Upon completion of the work of this section, remove all surplus materials, rubbish and debris from the premises.

END OF SECTION

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SECTION 06 16 00 - SHEATHING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Wall sheathing.
 - 2. Roof sheathing.
 - 3. Sheathing joint and penetration treatment.

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 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.

1.4 INFORMATIONAL SUBMITTALS

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 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 GA-600, "Fire Resistance Design Manual".

2.2 WOOD PANEL PRODUCTS

- A. Emissions: Products shall meet the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- B. 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.
 - 2. Oriented strand board.
- C. Plywood: DOC PS 1.
- D. Oriented Strand Board: DOC PS 2.
- E. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.
- F. Factory mark panels to indicate compliance with applicable standard.

2.3 PRESERVATIVE-TREATED PLYWOOD

- A. Preservative Treatment by Pressure Process: AWWA 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.
- B. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.
- C. Application: Treat items indicated on Drawings and plywood in contact with masonry or concrete or used with roofing, flashing, vapor barriers, and waterproofing.

2.4 WALL SHEATHING

- A. Plywood Wall Sheathing: As indicated on drawings
 - 1. Span Rating: As indicated on drawings.
 - 2. Nominal Thickness: As indicated on drawings.
- B. Oriented-Strand-Board Wall Sheathing: As indicated on drawings.
 - 1. Span Rating: As indicated on drawings.
 - 2. Nominal Thickness: As indicated on drawings.

2.5 ROOF SHEATHING

- A. Plywood Roof Sheathing: As indicated on drawings.
 - 1. Span Rating: As indicated on drawings.
 - 2. Nominal Thickness: As indicated on drawings.

- B. Oriented-Strand-Board Roof Sheathing: As in sheathing.
 - 1. Span Rating: As indicated on drawings.
 - 2. Nominal Thickness: As indicated on drawings.
- C. Paper-Surfaced Gypsum Wall Sheathing: ASTM C 1396/C 1396M, gypsum sheathing; with water-resistant-treated core and with water-repellent paper bonded to core's face, back, and long edges.
 - 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. American Gypsum.
 - b. G-P Gypsum Corporation.
 - c. LaFarge North America Inc.
 - d. National Gypsum Company.
 - e. Temple-Inland Inc.
 - f. United States Gypsum Co.
 - 2. Type and Thickness: Type X, 5/8 inch (15.9 mm) thick
 - 3. Edge and End Configuration: Square. 24-by-96-inch (610-by-2438-mm) size is only available for regular boards with tongue-and-groove long edges. Special-order lengths are available from some manufacturers but only in large quantities. SI (metric) module dimensions are not readily obtainable; verify availability by special order with manufacturers.
 - 4. Size: 24 by 96 inches (610 by 2438 mm) for horizontal 48 by 96 inches (1219 by 2438 mm) for vertical] [48 by 108 inches (1219 by 2743 mm) for vertical installation.

2.6 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
 - 1. 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 (0.835 mm) thick, use screws that comply with ASTM C 1002.
 2. For steel framing from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick, use screws that comply with ASTM C 954.
- G. Screws for Fastening Oriented-Strand-Board-Surfaced, Polyisocyanurate-Foam Sheathing to Metal Roof Deck: Steel drill screws, in type and 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. Provide washers or plates if recommended by sheathing manufacturer.

2.7 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

- A. Sealant for Paper-Surfaced 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 Division 07 Section "Joint Sealants."

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."
 3. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's "International Residential Code for One- and Two-Family Dwellings."
- 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. Nail to wood framing.
 - b. Screw to cold-formed metal framing.
 - c. Space panels 1/8 inch (3 mm) 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 wood framing with screws.
 2. Fasten gypsum sheathing to cold-formed metal framing with screws.
 3. Install boards with a 3/8-inch (9.5-mm) gap where non-load-bearing construction abuts structural elements.
 4. Install boards with a 1/4-inch (6.4-mm) 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 (200 mm) o.c. and set back a minimum of 3/8 inch (9.5 mm) 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 (200 mm) o.c. and set back a minimum of 3/8 inch (9.5 mm) 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

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SECTION 06 17 33 - WOOD I-JOISTS

PART 1 GENERAL

1.1 SECTION SCOPE

- A. Wood I-Joists.
- B. Wood I-Joist Bridging, Bracing, and Anchorage.
- C. Wood I-Joist Fasteners.

1.2 DESIGN REQUIREMENTS

- A. Provide all labor, materials, tools, facilities, and equipment required for the fabrication and installation of wood I-joists.

1.3 RELATED SECTIONS

- A. Section 06 10 00 – Rough Carpentry.
- B. Section 06 18 00 – Glued-Laminated Construction.
- C. See also non-structural specifications.

1.4 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.
- B. Unless otherwise noted, standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes as of the date of issue of these Specifications.
- C. Referenced Standards:
 - 1. California Building Code (2019)
 - 2. WCLIB – West Coast Lumber Inspection Bureau.
 - 3. WWPA – Western Wood Products Association.
 - 4. NFPA – National Forest Products Association.
 - 5. AWPA – American Wood Preservative Association.
 - 6. APA – The Engineered Wood Association.

1.5 SUBMITTALS

- A. General: Submit as noted below and per division 1.
- B. Shop Drawings: As required per drawings submit shop drawings indicating the sizes, types, and spacing of joists, loads and joist cambers, framed openings, blocking, bracing, and hanger information with sufficient detailing to ensure correct installation.

1.6 QUALITY ASSURANCE

- A. Perform work in accordance with the following agencies:

1. Lumber Grading Agency: Certified by ALSC
2. Structural Panel Grading Agency: Certified by APA
3. Manufacturing Facility: Approved by an independent ICBO approved inspection agency.
- B. All joists shall bear a stamp indicating the joist type, report number, manufacturer's name, plant number, and the independent inspection agency.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. If joists are stored prior to installation they shall be stored in a vertical position off the ground and covered and protected from weather, and per the joist manufacturer.
- B. Use equipment and methods that avoid damages that may impair the strength of the joists. Sharp instruments and unprotected wire rope, chain slings and the like shall not be permitted.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Wood I-Joists shall be of the types and sizes indicated on the drawings. If other manufacturer's joists are used they shall be subject to the Engineer's review upon submission of substantiating data, and may only be used if equivalent, in the Engineer's opinion, to wood I-Joists specified. Any substitutions for joists shall meet the proprietary floor assembly requirements for fire rating, and sound and impact requirements per architectural plans. All joists shall have a current ICC evaluation report.
- B. Lumber: All lumber used in the manufacturing of the wood I-Joists shall be graded by the NFPA, WCLIB or WWPA.
 1. Specific gravity of top and bottom flanges = 0.49 minimum.
- C. Manufactured Wood Material: All manufactured material used in the manufacturing of the wood I-Joists shall have a current ICC evaluation report. All sheathing material used for webs shall be APA rated sheathing conforming to PS1 or PS2.
 1. Specific gravity of top and bottom flanges = 0.49 minimum.
- D. Adhesive: Adhesive shall have a current ICC evaluation report.
- E. Accessories:
 1. Hangers, brackets, straps, ties, etc., as shown on drawings.
 2. Blocking as shown on drawings.

PART 3 EXECUTION

3.1 FABRICATION

- A. Fabrication shall be in compliance with specified standard and industry specifications and requirements of the manufacturer's current ICC evaluation report.
 1. Fabrication shall be in accordance with best practices with adequate plant and equipment and under supervision of properly qualified personnel.
 2. Moisture content of components at time of gluing shall not be less than 7% nor more than 16%.

3.2 EXAMINATION

- A. Verify that supports and openings are ready to receive joists. Coordinate placement of support items.

3.3 INSTALLATION

- A. Install joists in accordance with the drawings and manufacturer's specifications. Comply with all manufacturers' recommendations concerning temporary construction loads and erection bracing.
- B. Set structural members level and plumb, in correct position.

3.4 CLEAN-UP

- A. Upon completion of the work of this section, remove all surplus materials, rubbish and debris from the premises.

END OF SECTION

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SECTION 06 17 53 - FABRICATED WOOD TRUSSES

PART 1 GENERAL

1.1 SECTION SCOPE

- A. Fabricated Wood Trusses.
- B. Fabricated Wood Truss Bracing.
- C. Fabricated Wood Truss Hardware.

1.2 DESIGN REQUIREMENTS

- A. Furnish all material, equipment and labor necessary for the prefabrication, delivery and temporary setting of the wood trusses on plate line as shown on the drawings and all miscellaneous parts, including bridging, temporary and permanent bracing and all related items of hardware.

1.3 RELATED SECTIONS

- A. Section 06 10 00 – Rough Carpentry.
- B. Section 06 18 00 – Glued-Laminated Construction.
- C. See also non-structural specifications.

1.4 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.
- B. Unless otherwise noted, standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes as of the date of issue of these Specifications.
- C. Referenced Standards:
 - 1. California Building Code (2019)
 - 2. WCLIB – West Coast Lumber Inspection Bureau.
 - 3. NDS – National Design Specification for Wood Construction.
 - 4. TPI – Truss Plate Institute: Design Specification for Light Metal Plate Connected Wood Trusses.

1.5 SUBMITTALS

- A. General: Submit as noted below and per requirements of architect.
- B. Shop Drawings: As required per drawings submit shop drawings prior to fabrication and erection.
 - 1. Submit calculations and erection layouts to the Engineer for approval of adequacy of members proposed. Calculations shall be prepared and signed by licensed civil or structural engineer.
 - 2. Drawings shall be furnished by the manufacturer showing all critical dimensions for determining fit and placement in the building as well as the loads the products are designed to support. Provide elevations of each truss type indicating dimensions, loading, reaction and member and plate

sizes. Drawings shall also indicate sizes and location of bracing, blocking, hangers, etc., with sufficient detailing to ensure correct installation

1.6 QUALITY ASSURANCE

- A. All trusses shall be marked with the manufacturer's name and truss type keyed to the erection plans.
- B. All connector plates shall be marked with the manufacturer's name.
- C. All trusses shall bear TPI Quality Control marks.
- D. Qualifications of Manufacturer:
 - 1. Provide connector plates manufactured by a member of TPI. Comply with TPI quality control procedures.
 - 2. Truss Fabricator to participate in TPI "Quality Assurance Inspection Program" as a licensee authorized to apply TPI marks to trusses.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Handle and store trusses with care, and in accordance with the manufacturer's instructions and TPI recommendations to avoid damage from bending, overturning or other cause for which truss is not designed to resist or endure. Store off the ground.
- B. Time delivery and erection of trusses to avoid extended on-site storage and to avoid delaying work of other trades whose work must follow erection of trusses.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Trusses:
 - 1. Lumber: All lumber used for truss members shall conform to the published stress ratings for the species and grades. The moisture content of all lumber shall not exceed 19% nor be less than 7% at the time of fabrication.
 - 2. Lumber Species: Douglas Fir #2 and better for all members, unless otherwise approved by Engineer.
 - 3. Connectors: All truss connector plates shall be manufactured from quality galvanized sheet steel of no less than 20 gauge thickness which has a minimum yield of 33,000 psi and a minimum thickness ultimate tensile strength of 45,000 psi. The corrosion resistant coating shall be 1.25 oz. per square foot commercial class hot dipped galvanized. All plates shall conform to ASTM A446, Grade A and shall be ICBO approved.

2.2 DESIGN

- A. Engineering design shall account for all loads indicated and all mechanical units in conformance with the referenced codes.
- B. Truss profiles shall allow for ducting from mechanical units.
- C. Allowable stress increase for load duration shall be per drawings.

- D. Increases in allowable stresses for repetitive members shall be as approved by Engineer.
- E. Design and construction of connections shall be in accordance with published approvals of ICBO.
- F. If trusses are required to support fire sprinkler systems, truss designer shall incorporate one 250# vertical load on the bottom chord of all trusses from fire sprinkler line. Truss must be designed to carry the load at any panel point along the bottom chord.
- G. Truss layout shall be as shown on the structural drawings. Do not deviate without obtaining written approval from the structural engineer prior to preparing shop drawings.

2.3 FABRICATION

- A. All items specified to be fabricated hereunder shall be accurately cut or fitted, and rigidly fastened to produce quality trusses in accordance with designs and criteria contained in these specifications and the drawings.
- B. Cut truss members to accurate lengths, angles and sizes to produce close fitting joints with proper wood-to-wood bearing in assembled units.
- C. Fabricate metal connector plates to proper size, configuration, thickness and anchorage details required for types of joint designs indicated.
- D. Assemble truss members in design configuration indicated using jigs or other means to ensure uniformity and accuracy of assembly with close fitting joints. Position members to produce design camber as required.
- E. Truss designer shall oversize plates for chord members to account for wood defects like knots, knotholes and greatly distorted grains. Maximum allowable defect size per member shall be 2 square inches. No defects allowed under plates for web members.
- F. Built up girder trusses shall be laminated per truss designer.
- G. Gable end trusses shall be 2x verticals at 16"o.c. typical unless noted otherwise.
- H. All hardware required for connecting trusses (Jack to Hip, Hip to Girder, or Girder to Girder, etc.) shall be designed, detailed and provided by truss fabricator and shall meet minimum requirements shown on drawings.
- I. Truss manufacturer to verify all dimensions shown on Structural Drawings with Architectural drawings and in field with wall layout prior to fabrication.

PART 3 EXECUTION

3.1 ERECTION AND INSTALLATION

- A. General: Erect and brace trusses to comply with recommendations of manufacturer and TPI.
- B. Erect trusses with planes of truss webs vertical (plumb) and parallel to each other, locate accurately at design spacings indicated.
- C. Hoist units in place by means of proper lifting equipment suited to sizes and types of trusses required,

applied at proper lift points as recommended by Fabricator, exercising care not to damage truss members or joints by out-of-plane bending or other causes.

- D. Provide temporary bracing as required to maintain trusses plumb, parallel and in proper location, until permanent bracing is installed.
- E. Anchor trusses securely at all bearing points to comply with methods and details indicated.
- F. Install permanent bracing, end pieces, blocking and related components to enable trusses to maintain design spacing, withstand live and dead loads including lateral loads, and to comply with other indicated requirements.
- G. Do not cut or remove truss members.
- H. Provide Simpson DTC, STC roof truss clips at all cross points between truss members and non-load bearing walls to provide for alignment control and truss movement when full dead loads are applied. Make sure slot nails are installed at the middle of the slot.

END OF SECTION

SECTION 06 20 23 - INTERIOR FINISH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Wood trim and window sills.
2. Interior wood wall base
3. Painted MDF base.
4. Interior frames and jambs.

B. Related Requirements:

1. Section 06 10 00 "Rough Carpentry" for furring, blocking, and other carpentry work not exposed to view.
2. Section 08 14 16 "Flush Wood Doors" for coordination of wood frames and jambs installed with flush wood doors.
3. Section 09 91 00 "Painting" for priming and backpriming of interior finish carpentry for opaque finishes.

1.3 SUBMITTALS

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

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. Include chemical-treatment manufacturer's written instructions for finishing treated material.
2. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.
3. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced before shipment to Project site to levels specified.

B. Samples for Verification:

1. For each species and cut of lumber products with nonfactory-applied finish, with half of exposed surface finished, 50 sq. in. (300 sq. cm) for lumber.
2. For each finish system and color of lumber products with factory-applied finish, 50 sq. in. (300 sq. cm) for lumber.

1.4 QUALITY ASSURANCE

- A. Forest Stewardship Certification (FSC): Provide all wood products with FSC certification and chain-of-custody documentation; refer to sustainability requirements above.
- B. 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.

- C. Mockups: Build sample mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
- D. Overage: Ensure appropriate amount of overage to account for quality requirement; for all WD-# types allow for approximately 25 percent additional materials to allow sorting and rejecting to meet quality requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

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

1.6 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install interior finish carpentry materials until building is enclosed and weatherproof, wet work in space is completed and nominally dry, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.
 - 1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Regional Materials: The following wood products shall be manufactured within 100 miles (160 km) of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles (160 km) of Project site.
- B. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the American Lumber Standard Committee's Board of Review. Grade lumber by an agency certified by the American Lumber Standard Committee's Board of Review to inspect and grade lumber under the rules indicated.
 - 1. Factory mark each piece of lumber with grade stamp of grading agency.
 - 2. For exposed lumber, mark grade stamp on end or back of each piece, or omit grade stamp and provide certificates of grade compliance issued by grading agency.
- C. Softwood Plywood: DOC PS 1.
- D. Medium Density Fiberboard (MDF): ANSI A208.2, Grade 130.

2.2 FIRE-RETARDANT-TREATED MATERIALS

- A. General: For applications indicated, use materials complying with requirements in this article that are acceptable to authorities having jurisdiction and comply with testing requirements; testing will be conducted 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, 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 (3.2 m) beyond the centerline of the burners at any time during the test.
 - 1. Kiln dry lumber and plywood after treatment to a maximum moisture content of 19 and 15 percent, respectively.
- C. For exposed items indicated to receive a stained or natural finish, use organic resin chemical formulations that do not contain colorants, and provide materials that do not have marks from spacer sticks on exposed face.
- D. Do not use material that does not comply with requirements for untreated material or is warped or discolored.
- E. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece or omit marking and provide certificates of treatment compliance issued by inspection agency.
 - 2. For exposed plywood indicated to receive a stained or natural finish, mark back of each piece.
- F. Application: All interior lumber and plywood.

2.3 WOOD WALL BASE

- A. Material: Finger jointed; as approved by Architect.
- B. Cut and Grade: Paint grade wood.
- C. Thickness: 1/2 by 4 inches.
- D. Finish: Primed and field-painted; refer to Finishes articles below.

2.4 PAINTED MDF BASE:

- A. Architectural Woodwork Standards Grade: Custom.
- B. Material: Medium density fiberboard (MDF).
- C. Thickness: 1/2 inch actual, or as detailed.
- D. Height: 4 inches actual, or as detailed.
- E. Finish: Primed and field-painted; refer to Finishes articles below.

2.5 INTERIOR FRAMES AND JAMBS

- A. Architectural Woodwork Standards Grade: Custom.
- B. Wood Species and Cut: To match flush wood doors as specified in Section 08 14 16 "Flush Wood Doors".

- C. For frames or jambs wider than available lumber, use veneered construction. Do not glue for width.
 - 1. Do not use plain-sawn softwood lumber with exposed, flat surfaces more than 3 inches (76 mm) wide.
- D. Fire-Rated Interior Frames and Jambs: Products fabricated from fire-retardant particleboard or fire-retardant MDF with veneered exposed surfaces and listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.
 - 1. Fire Rating: As indicated.

2.6 MISCELLANEOUS MATERIALS

- A. Fasteners for Interior Finish Carpentry: Nails, screws, and other anchoring devices of type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible.
- B. Exposed Fasteners: Trim head, auger point, stainless steel type 316, #1 square drive.
 - 1. Basis-of- Design Products: #7 x 1-5/8 inch by McFeely's, Div. of Lab Safety Supply, Inc.; www.mcfeelys.com.
 - 2. Other Approved Manufacturers:
 - a. Headcote, a div. of Starborn Industries, Inc.; www.starbornindustries.com.
 - b. Rockler; www.rockler.com.
 - c. or approved equal.
- C. Low-Emitting Materials: Adhesives shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- D. Glue: Aliphatic-resin, polyurethane, or resorcinol wood glue recommended by manufacturer for general carpentry use.
- E. Multipurpose Construction Adhesive: Formulation complying with ASTM D 3498 that is recommended for indicated use by adhesive manufacturer.

2.7 FABRICATION

- A. Back out or kerf backs of the following members, except those with ends exposed in finished work:
 - 1. Interior standing and running trim, except shoe and crown molds.
- B. Ease edges of lumber less than 1 inch (25 mm) in nominal thickness to 1/16-inch (1.5-mm) radius and edges of lumber 1 inch (25 mm) or more in nominal thickness to 1/8-inch (3-mm) radius.

2.8 FINISHES

- A. Preparations for Finishing: Comply with the Architectural Woodwork Standards for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing interior architectural woodwork, as applicable to each unit of work.
- B. Interior Architectural Woodwork for Opaque Finishes: Shop prime with one coat of wood primer for field painting as specified in Section 09 91 00 "Painting."

- C. Interior Architectural Woodwork for Transparent Finishes: Mill- or shop-prestaining; one coat water repellent penetrating translucent decorative stain.
 - 1. Transparent Finish, WD PNL 4:
 - a. Grade: Custom.
 - b. System - 5 is a durable, repairable, and good general-purpose fine finish.
 - c. Finish: System - 5, conversion varnish.
 - d. Wash Coat for Closed-Grain Woods: Apply wash-coat sealer to wood before staining and finishing.
 - e. Open Finish for Open-Grain Woods: Do not apply filler to open-grain woods.
 - f. Sheen: Flat, 15-30 gloss units measured on 60-degree gloss meter per ASTM D 523 to match Architect's approved sample.
 - 2. Natural Oil Waterborne Wood Stain, WD PNL 5: Penetrating wood stain and protectant for interior or exterior wood.
 - a. Basis-of-Design Product, Exterior Wood Screens: Log & Siding Formula by Timber Pro Coatings; www.timberprocoatingsusa.com.
 - 1) Color: Clear.
- D. Preparation for Finishing: Comply with Architectural Woodwork Standards, Section 5 for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing interior architectural woodwork, as applicable to each unit of work.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

- A. Clean substrates of projections and substances detrimental to application.
- B. Before installing interior finish carpentry, condition materials to average prevailing humidity in installation areas for a minimum of 24 hours unless longer conditioning is recommended by manufacturer.

3.3 INSTALLATION, GENERAL

- A. Do not use materials that are unsound; warped; improperly treated or finished; inadequately seasoned; too small to fabricate with proper jointing arrangements; or with defective surfaces, sizes, or patterns.
- B. Install interior finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.
 - 1. Scribe and cut interior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
 - 2. Where face fastening is unavoidable, countersink fasteners, fill surface flush, and sand unless otherwise indicated.

3. Install to tolerance of 1/8 inch in 96 inches (3 mm in 2438 mm) for level and plumb. Install adjoining interior finish carpentry with 1/32-inch (0.8-mm) maximum offset for flush installation and 1/16-inch (1.5-mm) maximum offset for reveal installation.
4. Install stairs with no more than 3/16-inch (4.7-mm) variation between adjacent treads and risers and with no more than 3/8-inch (9.5-mm) variation between largest and smallest treads and risers within each flight.
5. Coordinate interior finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate interior finish carpentry.

3.4 STANDING AND RUNNING TRIM INSTALLATION

- A. Install with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 24 inches (610 mm) long, except where necessary. Stagger joints in adjacent and related standing and running trim. Miter at returns, miter at outside corners, and cope at inside corners to produce tight-fitting joints with full-surface contact throughout length of joint. Use scarf joints for end-to-end joints. Plane backs of casings to provide uniform thickness across joints where necessary for alignment.
 1. Match color and grain pattern of trim for transparent finish (stain or clear finish) across joints.
 2. Install trim after gypsum-board joint finishing operations are completed.
 3. Install without splitting; drill pilot holes before fastening where necessary to prevent splitting. Fasten to prevent movement or warping. Countersink fastener heads on exposed carpentry work and fill holes.

3.5 PANELING INSTALLATION

- A. Board Paneling: Install according to manufacturer's written instructions.
 1. Arrange in random-width pattern suggested by manufacturer unless boards or planks are of uniform width.
 2. Install in full lengths without end joints.
 3. Stagger end joints in random pattern to uniformly distribute joints on each wall.
 4. Install with uniform end joints with only end-matched (tongue-and-groove) joints within each field of paneling.
 5. Install with uniform end joints. Locate end joints only over furring or blocking.
 6. Select and arrange boards on each wall to minimize noticeable variations in grain character and color between adjacent boards.
 7. Install with uniform tight joints between boards.
 8. Fasten paneling by one of the following:
 - a. Face nailing, setting nails, and filling over nail heads.
 - b. Trim screws, set below face and filled.
 - c. Blind nailing through tongues.
- B. Plywood Paneling Installed as Interior Ceilings:
 1. Plywood Ceilings: Select and arrange panels on floor at each wall for review and approval by Architect; intent is to minimize noticeable variations in grain character and color between adjacent panels.
 - a. Coordinate framing to such that panels joints occur over support.

- b. Install with uniform tight joints between panels, oriented horizontally and aligned as indicated in Drawings. Partial panels shall be oriented to match full panels.
- c. Attach panels to supports with manufacturer's recommended panel adhesive and fasteners.
 - 1) Place exposed fasteners at consistent and aligned spacing and distance from all edges horizontal and vertical; do not place fasteners so close to edges as to damage exposed face.
- d. Panels damaged during installation, included damage due to fastener placement, shall be removed and replaced.

3.6 ADJUSTING

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

3.7 CLEANING

- A. Clean interior finish carpentry on exposed and semiexposed surfaces. Restore damaged or soiled areas and touch up factory-applied finishes if any.

3.8 PROTECTION

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

END OF SECTION

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SECTION 06 41 00 - ARCHITECTURAL CASEWORK

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. Architectural wood casework.
2. Countertops and backsplash.
3. Plastic laminate wainscots.
4. Cabinet hardware and accessories.
5. Wood furring, blocking, shims, and hanging strips for installing architectural wood cabinets unless concealed within other construction before cabinet installation.

B. Related Requirements:

1. Section 06 10 00 "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 35 30 "Residential Casework" for unit casework and countertops.
3. Division 22 "Plumbing" Sections for coordination of fixtures with cabinets.

1.3 PREINSTALLATION MEETINGS

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

1.4 SUBMITTALS

- A. Product Data: For each type of product, including panel products, fire-retardant-treated materials, cabinet hardware and accessories, and finishing materials and processes.

1. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.

- B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

1. Show details full size.
2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
3. Show locations and sizes of cutouts and holes for electrical switches and outlets and other items installed in architectural wood cabinets.
4. Show veneer leaves with dimensions, grain direction, exposed face, and identification numbers indicating the flitch and sequence within the flitch for each leaf.
5. Apply AWI Quality Certification Program label to Shop Drawings.
6. For countertops. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.

- C. Samples for Initial Selection:
 - 1. Shop-applied transparent finishes.
 - 2. Shop-applied opaque finishes.
 - 3. Plastic laminates.
 - 4. Powder coated finishes.
 - 5. Painted and primed finishes.
- D. Samples for Verification:
 - 1. Plastic laminates, 12 by 12 inches, for each type, color, pattern, and surface finish, with one sample applied to core material and specified edge material applied to one edge.
 - 2. 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.
 - 3. Exposed cabinet hardware and accessories, one unit for each type and finish.
 - 4. For the Following Countertop Products:
 - a. Countertop material, 6 inches square.
 - b. Wood trim, 8 inches long.
 - c. One full-size solid surface material countertop, with front edge, 8 by 10 inches, of construction and in configuration specified.
- E. Woodwork Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

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.
- C. Overage: Ensure appropriate amount of overage to account for quality requirement; for all WD-# types allow for approximately 25 percent additional materials to allow sorting and rejecting to meet quality requirements.

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. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 17 and 50 percent during the remainder of the construction period.

- C. 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.

- D. 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 wood-veneer-faced architectural cabinets can be supported and installed as indicated.
- B. Hardware Coordination: Distribute copies of approved hardware schedule specified in Section 08 71 00 "Door Hardware" to fabricator of architectural woodwork; coordinate Shop Drawings and fabrication with hardware requirements.

PART 2 - PRODUCTS

2.1 ARCHITECTURAL CABINET MANUFACTURERS

- A. Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production of architectural wood cabinets with sequence-matched wood paneling, wood doors with face veneers that are sequence matched with woodwork and transparent-finished wood doors that are required to be of same species as woodwork.

2.2 ARCHITECTURAL CABINETS, GENERAL

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of architectural wood cabinets indicated for construction, finishes, installation, and other requirements.
 - 1. Provide labels and 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.

2.3 WOOD CABINETS, CASEWORK

- A. Grade: Premium.
- B. Type of Construction: Frameless.
- C. Cabinet and Door and Drawer Front Interface Style: Flush overlay.
- D. Reveal Dimension: As indicated.
- E. Wood for Exposed Surfaces:
 - 1. Face Veneers: As selected by Architect.
- F. Semi-Exposed Surfaces: Provide surface materials indicated below:
 - 1. Surfaces Other Than Drawer Bodies: Same species and cut indicated for exposed surfaces.
 - 2. Drawer Subfronts, Backs, and Sides: Solid-hardwood lumber.

3. Drawer Bottoms: Hardwood plywood.

G. Dust Panels: 1/4-inch plywood or tempered hardboard above compartments and drawers unless located directly under tops.

H. 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.

2.4 COUNTERTOPS

A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of plastic-laminate-clad countertops indicated for construction, finishes, installation, and other requirements.

1. Provide inspections of fabrication and installation together with labels and certificates from AWI certification program indicating that countertops comply with requirements of grades specified.

2. The Contract Documents contain requirements that are more stringent than the referenced quality standard. Comply with requirements of Contract Documents in addition to those of the referenced quality standard.

B. Quartz agglomerate countertop, fabricated according to manufacturer's written instructions and the AWI/AWMAC/WI's "Architectural Woodwork Standards."

1. Basis-of-Design Manufacturer: Caesarstone; www.caesarstoneus.com.

2. Configuration:

a. Front: Straight, slightly eased at top with separate apron.

b. Backsplash: Straight, slightly eased at corner.

3. Fabricate tops with shop-applied edges and backsplashes unless otherwise indicated. Comply with quartz agglomerate manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.

a. Fabricate with loose backsplashes for field assembly.

C. Core Thickness: 1-1/8 inch.

1. Build up countertop thickness to 2-1/4 inches at front, back, and ends with additional layers of core material laminated to top.

2.5 PLASTIC LAMINATE WAINSCOTS

A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of plastic-laminate backsplashes and wainscots indicated for construction, finishes, installation, and other requirements.

1. Provide inspections of fabrication and installation together with labels and certificates from AWI certification program indicating that backsplashes and wainscots comply with requirements of grades specified.

2. The Contract Documents contain requirements that are more stringent than the referenced quality standard. Comply with requirements of Contract Documents in addition to those of the referenced quality standard.

- B. Plastic laminate wainscots, fabricated according to manufacturer's written instructions and the AWI/AWMAC/WI's "Architectural Woodwork Standards."
 - 1. Basis-of-Design Product: High Pressure Laminate by Wilsonart LLC.; www.wilsonart.com.
 - a. Color: No. 4656 "Bronze Legacy".
 - b. Finish: As selected by Architect.
 - 2. Height: 4 feet.
 - 3. Applications: Restroom and Laundry Room in Community Building.
- C. Plywood Substrates: Exterior grade softwood plywood complying with DOC PS 1, Grade C-C Plugged, touch sanded; waterproof. See Casework plywood for additional requirements applicable to plywood substrates used in countertop assemblies.

2.6 WOOD MATERIALS

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
 - 1. Do not use plain-sawn softwood lumber with exposed, flat surfaces more than 3 inches wide.
 - 2. Wood Moisture Content: 8 to 13 percent.
- B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
 - 1. Medium-Density Fiberboard (MDF): ANSI A208.2, Grade 130, unless indicated otherwise.
 - 2. Softwood Plywood: DOC PS 1, medium-density overlay.
 - 3. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1.
 - 4. Thermoset Decorative Panels: Particleboard or medium-density fiberboard 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.

2.7 FIRE-RETARDANT-TREATED MATERIALS

- A. Fire-Retardant-Treated Materials, 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.
 - 1. Use treated materials that comply with requirements of referenced woodworking standard. Do not use materials that are warped, discolored, or otherwise defective.
 - 2. Use fire-retardant-treatment formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants to distinguish treated materials from untreated materials.
 - 3. Identify fire-retardant-treated materials with appropriate classification marking of qualified testing agency in the form of removable paper label or imprint on surfaces that will be concealed from view after installation.
- B. Fire-Retardant-Treated Lumber and Plywood: Products with a flame-spread index of 26 to 75 when tested according to ASTM E84, 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. Kiln dry lumber and plywood after treatment to a maximum moisture content of 19 and 15 percent, respectively.
 2. For items indicated to receive a stained or natural finish, use organic resin chemical formulation.
 3. Mill lumber after treatment within limits set for wood removal that do not affect listed fire-test-response characteristics, using a woodworking shop certified by testing and inspecting agency.
 4. Mill lumber before treatment and implement special procedures during treatment and drying processes that prevent lumber from warping and developing discolorations from drying sticks or other causes, marring, and other defects affecting appearance of treated woodwork.
- C. Fire-Retardant Particleboard: Panels complying with the following requirements, made from softwood particles and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 26-75 and smoke-developed index of 450 or less per ASTM E84.
1. For panels 3/4 inch thick and less, comply with ANSI A208.1 for Grade M-2 except for the following minimum properties: modulus of rupture, 1600 psi; modulus of elasticity, 300,000 psi; internal bond, 80 psi; and screw-holding capacity on face and edge, 250 and 225 lbf, respectively.
 2. For panels 13/16 to 1-1/4 inches thick, comply with ANSI A208.1 for Grade M-1 except for the following minimum properties: modulus of rupture, 1300 psi; modulus of elasticity, 250,000 psi; linear expansion, 0.50 percent; and screw-holding capacity on face and edge, 250 and 175 lbf, respectively.
- D. Fire-Retardant Fiberboard: Medium-density fiberboard panels complying with ANSI A208.2, made from softwood fibers, synthetic resins, and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 26 to 75 and smoke-developed index of 450 or less per ASTM E84.

2.8 CABINET HARDWARE AND ACCESSORIES

- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets except for items specified in Section 08 71 00 "Door Hardware".
- B. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 135 degrees of opening.
- C. Back-Mounted Pulls: BHMA A156.9, B02011:
- D. Catches: Push-in magnetic catches, BHMA A156.9, B03131.
- E. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081.
- F. Shelf Rests: BHMA A156.9, B04013; metal, two-pin type with shelf hold-down clip.
- G. Drawer Slides: BHMA A156.9.
1. Grade 1: Side mounted and extending under bottom edge of drawer; full-extension type; zinc-plated steel with polymer rollers.
 2. Grade 1HD-100 and Grade 1HD-200: Side mounted; full-overtravel-extension type; zinc-plated-steel ball-bearing slides.
 3. For drawers not more than 3 inches high and not more than 24 inches wide, provide Grade 1.
 4. 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.

5. For drawers more than 6 inches high or more than 24 inches wide, provide Grade 1HD-200.
 6. For computer keyboard shelves, provide Grade 1HD-100.
 7. For trash bins not more than 20 inches high and 16 inches wide, provide Grade 1HD-200.
 - H. Aluminum Slides for Sliding Glass Doors: BHMA A156.9, B07063.
 - I. Door Locks: BHMA A156.11, E07121.
 1. Basis-of-Design Products: By CompX International, Inc.; www.compx.com.
 - a. Door Lock: Model no. C8173-4 Pin Tumbler Door Lock; reference no. M2-3713-301.
 - b. Strike Plate: Model no. C2004 Flat Strike.
 - J. Drawer Locks: BHMA A156.11, E07041.
 1. Basis-of-Design Products: By CompX International, Inc.; www.compx.com.
 - a. Drawer Lock: Model no. C8178-4 Pin Tumbler Drawer Lock; reference no. M2-3718-301.
 - 1) Option B, Drawer Lock: Model no. C8133-26D Pin Tumbler Drawer Lock; reference no. M2-3700-111.
 - b. Strike Plate: Model no. C2004 Flat Strike.
 - K. Door and Drawer Silencers: BHMA A156.16, L03011.
 - L. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
 1. Dark, Oxidized, Satin Bronze, Oil Rubbed: BHMA 613 for bronze base; BHMA 640 for steel base; match Architect's sample.
 2. Bright Brass, Clear Coated: BHMA 605 for brass base; BHMA 632 for steel base.
 3. Bright Brass, Vacuum Coated: BHMA 723 for brass base; BHMA 729 for zinc-coated-steel base.
 4. Satin Brass, Blackened, Bright Relieved, Clear Coated: BHMA 610 for brass base; BHMA 636 for steel base.
 5. Satin Chromium Plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.
 6. Bright Chromium Plated: BHMA 625 for brass or bronze base; BHMA 651 for steel base.
 7. Satin Stainless Steel: BHMA 630.
- 2.9 MISCELLANEOUS MATERIALS
- A. Furring, Blocking, Shims, and Hanging Strips: Fire-retardant-treated softwood 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. Adhesive for Bonding Plastic Laminate: Unpigmented contact cement.
 1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.
- 2.10 CABINET FABRICATION
- A. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.

- B. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:
 - 1. Corners of Cabinets: 1/16 inch unless otherwise indicated.
- C. Complete fabrication, including assembly, finishing, 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.
- D. 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.

2.11 COUNTERTOP FABRICATION

- A. Fabricate countertops according to quartz agglomerate manufacturer's written instructions and the AWI/AWMAC/WI's "Architectural Woodwork Standards."
- B. Configuration: As indicated in Drawings.
- C. Countertops: 3/4-inch-thick, quartz agglomerate with front edge built up with same material.
- D. Fabricate tops with shop-applied edges unless otherwise indicated. Comply with quartz agglomerate manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.
- E. Joints: Fabricate countertops in sections for joining in field.
- F. Cutouts and Holes:
 - 1. Undercounter Plumbing Fixtures: Make cutouts for fixtures using template or pattern furnished by fixture manufacturer. Form cutouts to smooth, even curves.
 - a. Provide vertical edges, slightly eased at juncture of cutout edges with top and bottom surfaces of countertop and projecting 3/16 inch into fixture opening.
 - b. Provide vertical edges, rounded to 3/8-inch radius at juncture of cutout edges with top surface of countertop, slightly eased at bottom, and projecting 3/16 inch into fixture opening.
 - c. Provide 3/4-inch full bullnose edges projecting 3/8 inch into fixture opening.
 - 2. Counter-Mounted Plumbing Fixtures: Prepare countertops in shop for field cutting openings for counter-mounted fixtures. Mark tops for cutouts and drill holes at corners of cutout locations. Make corner holes of largest radius practical.
 - 3. Fittings: Drill countertops in shop for plumbing fittings, undercounter soap dispensers, and similar items.
 - 4. Counter-Mounted Cooktops: Prepare countertops in shop for field cutting openings for cooktops. Mark tops for cutouts and drill holes at corners of cutout locations. Make corner holes of largest radius practical.

2.12 SHOP FINISHING

- A. General: Finish architectural wood cabinets at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.
- B. General: Shop finish transparent-finished architectural wood cabinets at fabrication shop as specified in this Section.
- C. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural wood cabinets, as applicable to each unit of work.
 - 1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of cabinets.
- D. Transparent Finish:
 - 1. Grade: Premium.
 - 2. Finish: System - 5, conversion varnish.
 - 3. Wash Coat for Closed-Grain Woods: Apply wash-coat sealer to cabinets made from closed-grain wood before staining and finishing.
 - 4. Staining: Clear to match Architect's sample.
 - 5. Open Finish for Open-Grain Woods: Do not apply filler to open-grain woods.
 - 6. Filled Finish for Open-Grain Woods After staining, apply wash-coat sealer and allow to dry. Apply paste wood filler and wipe off excess. Tint filler to match stained wood.
 - 7. Sheen: Flat, 15-30 gloss units measured on 60-degree gloss meter per ASTM D523 to match Architect's approved sample.

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 EXAMINATION

- A. Examine substrates to receive solid surface material countertops and conditions under which countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of countertops.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 CABINET 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.
- 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 or finishing screws for exposed fastening, countersunk and filled flush with woodwork.
 - 1. For shop finished items use filler matching finish of items being installed.
- F. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
 - 1. Install cabinets with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
 - 2. Maintain veneer sequence matching of cabinets with transparent finish.
 - 3. 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.
- G. Touch up finishing work specified in this Section after installation of woodwork. Fill nail holes with matching filler where exposed.
 - 1. Apply specified finish coats, including stains and paste fillers if any, to exposed surfaces where only sealer/prime coats are applied in shop.

3.4 COUNTERTOP INSTALLATION

- A. Install countertops level to a tolerance of 1/8 inch in 8 feet, 1/4 inch maximum. Do not exceed 1/64-inch difference between planes of adjacent units.
- B. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Predrill holes for screws as recommended by manufacturer. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
- C. Fasten subtops to cabinets by screwing through subtops into cornerblocks of base cabinets. Shim as needed to align subtops in a level plane.
- D. Secure countertops to subtops with adhesive according to solid surface material manufacturer's written instructions. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
- E. Bond joints with adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to joints to prevent adhesive smears.
 - 1. Install metal splines in kerfs in countertop edges at joints. Fill kerfs with adhesive before inserting splines and remove excess immediately after adjoining units are drawn into position.
 - 2. Clamp units to temporary bracing, supports, or each other to ensure that countertops are properly aligned and joints are of specified width.
- F. Install backsplashes and end splashes by adhering to wall and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears.
- G. Install aprons to backing and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears. Fasten by screwing through backing. Predrill holes for screws as recommended by manufacturer.
- H. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Make cutouts to accurately fit items to be installed, and at right angles to

finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.

1. Seal edges of cutouts in particleboard subtops by saturating with varnish.

I. Apply sealant to gaps at walls; comply with Section 07 92 00 "Joint Sealants."

3.5 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 semi-exposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION

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SECTION 07 11 13 - BITUMINOUS DAMPPROOFING

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. Cold-applied, emulsified-asphalt dampproofing.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include recommendations for method of application, primer, number of coats, coverage or thickness, and protection course.
- B. Material Certificates: For each product, signed by manufacturers.
- C. Compatibility Letter and Chart:
 - 1. Provide a compatibility letter certifying physical and chemical compatibility of products in this section with all other dampproofing, waterproofing, weather barrier, roofing, self-adhered flashing and sealant products in the Project. Coordinate with the following Sections:
 - a. Section 07 27 25 "Weather Barriers".
 - b. Section 07 62 00 "Sheet Metal Flashing and Trim".
 - c. Section 07 92 00 "Joint Sealants".
 - 2. Provide input from this section toward a single Compatibility Chart to be compiled by the General Contractor. Compatibility Chart shall indicate 1) All dampproofing, waterproofing, weather barrier, roofing, self-adhered flashing and sealant products, 2) Which other products from this group they interface (are in contact with) in the Project, and 3) The physical and chemical compatibility between those interfaced products.

1.4 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit asphalt dampproofing to be performed according to manufacturers' written instructions.
- B. Ventilation: Provide adequate ventilation during application of dampproofing in enclosed spaces. Maintain ventilation until dampproofing has thoroughly cured.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. VOC Content: Products are to comply with VOC content limits of authorities having jurisdiction unless otherwise indicated.

2.2 MANUFACTURERS

- A. Source Limitations: Obtain primary dampproofing materials and primers through one source from a single manufacturer. Provide secondary materials recommended by manufacturer of primary materials.

2.3 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING:

- A. Basis-of-Design Product: MasterSeal 615 (formerly Hydrocide 700B) by Master Builders Solutions Construction Systems US, LLC; www.master-builders-solutions.com/en-us.
- B. Other Acceptable Products:
 - 1. Dehydratine 75 or 85 Emulsified Asphalt Dampproofing Compounds by Euclid Chemical Co., The; www.euclidchemical.com.
 - 2. 220 Fibered Emulsion Dampproofing by Karnak; www.karnakcorp.com.
 - 3. Sealmastic Emulsion-Type Dampproofing by W. R. Meadows, Inc.; www.wrmeadows.com.
 - 4. Or approved equal.
- C. Trowel Coats: ASTM D1227, Type II, Class 1.
- D. Fibered Brush and Spray Coats: ASTM D1227, Type II, Class 1.
- E. Brush and Spray Coats: ASTM D1227, Type III, Class 1.

2.4 MOLDED-SHEET DRAINAGE PANELS

- A. Nonwoven-Geotextile-Faced, Molded-Sheet Drainage Panel: Composite subsurface drainage panel acceptable to dampproofing manufacturer and consisting of a studded, nonbiodegradable, molded-plastic-sheet drainage core; with a nonwoven, needle-punched geotextile facing with an apparent opening size not exceeding No. 70 (0.21-mm) sieve laminated to one side of the core, with or without a polymeric film bonded to the other side; and with a vertical flow rate through the core of 9 to 21 gpm per ft.

2.5 INSULATION DRAINAGE PANELS

- A. Insulation Drainage Panels: Unfaced or geotextile-faced, extruded-polystyrene board insulation according to ASTM C578, Type IV, 25-psi, or Type VI, 40-psi, minimum compressive strength; fabricated with shiplap or channel edges and with one side having grooved drainage channels.
 - 1. Approved Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. DiversiFoam Products; www.diversifoam.com.
 - b. Dow Chemical Co.; www.dow.com.
 - c. Owens Corning; www.owenscorning.com.
 - d. T. Clear Corp.; www.tclear.com.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with applicator present, for compliance with requirements for surface smoothness, maximum surface moisture content, and other conditions affecting performance of the Work.
- B. Proceed with application only after substrate construction and penetrating work have been completed and unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for dampproofing application.

- B. Mask or otherwise protect adjoining exposed surfaces from being stained, spotted, or coated with dampproofing. Prevent dampproofing materials from entering and clogging weep holes and drains.
- C. Clean substrates of projections and substances detrimental to dampproofing work; fill voids, seal joints, and remove bond breakers if any.
- D. Apply patching compound to patch and fill tie holes, honeycombs, reveals, and other imperfections; cover with asphalt-coated glass fabric.

3.3 APPLICATION, GENERAL

- A. Comply with manufacturer's written instructions for dampproofing application, cure time between coats, and drying time before backfilling unless otherwise indicated.
 - 1. Apply dampproofing to provide continuous plane of protection.
 - 2. Apply additional coats if recommended in writing by manufacturer or to achieve a smooth surface and uninterrupted coverage.
- B. Where dampproofing footings and foundation walls, apply from finished-grade line to top of footing; extend over top of footing and down a minimum of 6 inches over outside face of footing.
 - 1. Extend dampproofing 12 inches onto intersecting walls and footings, but do not extend onto surfaces exposed to view when Project is completed.
 - 2. Install flashings and corner protection stripping at internal and external corners, changes in plane, construction joints, cracks, and where indicated as "reinforced," by embedding an 8-inch-wide strip of asphalt-coated glass fabric in a heavy coat of dampproofing. Dampproofing coat for embedding fabric is in addition to other coats required.
- C. Where dampproofing exterior face of inner wythe of exterior masonry cavity walls, lap dampproofing at least 1/4 inch onto flashing, masonry reinforcement, veneer ties, and other items that penetrate inner wythe.
 - 1. Extend dampproofing over outer face of structural members and concrete slabs that interrupt inner wythe.
 - 2. Lap dampproofing at least 1/4 inch onto shelf angles supporting veneer.
- D. Where dampproofing interior face of above-grade, exterior concrete or masonry walls, continue dampproofing through intersecting walls by keeping vertical mortar joints at intersection temporarily open or by dampproofing wall before constructing intersecting walls.

3.4 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

- A. Concrete Foundations: Apply two brush or spray coats at not less than 1.5 gal./100 sq. ft. for first coat and 1 gal./100 sq. ft. for second coat.
- B. Parged Masonry Foundation Walls: Apply one trowel coat at not less than 4 gal./100 sq. ft.
- C. Unparged Masonry Foundation Walls: Apply primer and one trowel coat at not less than 5 gal./100 sq. ft.
- D. Unexposed Face of Concrete Retaining Walls: Apply one brush or spray coat at not less than 1.25 gal./100 sq. ft.
- E. Unexposed Face of Masonry Retaining Walls: Apply primer and one brush or spray coat at not less than 1.25 gal./100 sq. ft.
- F. Concrete Backup for : Apply one brush or spray coat at not less than 1 gal./100 sq. ft.
- G. Masonry Backup for Masonry or Stone Veneer: Apply primer and one brush or spray coat at not less than 1 gal./100 sq. ft.

- H. Exterior Face of Inner Wythe of Cavity Walls: Apply primer and one brush or spray coat at not less than 1 gal./100 sq. ft.

3.5 PROTECTION COURSE INSTALLATION

- A. Install protection course over completed-and-cured dampproofing. Comply with dampproofing-material and protection-course manufacturers' written instructions for attaching protection course.
 - 1. Support protection course over cured coating with spot application of adhesive type recommended in writing by protection-board manufacturer.
 - 2. Install protection course on same day of dampproofing installation (while coating is tacky) to ensure adhesion.

3.6 DRAINAGE PANEL INSTALLATION

- A. Molded- Sheet Drainage Panels: Install panels, with geotextile facing away from wall substrate, according to manufacturer's written instructions. Use adhesive or another method that does not penetrate dampproofing. Lap edges and ends of geotextile to maintain continuity. Protect installed molded-sheet drainage panels during subsequent construction.
 - 1. Install thermal insulation specified in Section 07 21 00 "Thermal Insulation," or protection course before installing drainage panels.
- B. Insulation Drainage Panels: Install panels over dampproofed surfaces. Use adhesive or another method that does not penetrate dampproofing. Cut and fit panels to within 3/4 inch of projections and penetrations.
 - 1. Ensure that drainage channels are aligned and free of obstructions.

3.7 PROTECTION

- A. Protect installed insulation drainage panels from damage due to UV light, harmful weather exposures, physical abuse, and other causes. Provide temporary coverings where panels are subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.
- B. Correct dampproofing that does not comply with requirements; repair substrates, and reapply dampproofing.

END OF SECTION

SECTION 07 18 00 - TRAFFIC COATINGS

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 traffic coatings and pavement markings for the following applications:
 - 1. Pedestrian traffic.
- B. Related Requirements:
 - 1. Section 03 30 00 "Cast-in-Place Concrete" for surface preparation of concrete receiving traffic coatings.
 - 2. Section 03 38 00 "Post-Tensioned Concrete".
 - 3. Section 07 62 00 "Sheet Metal Flashing and Trim".

1.3 PREINSTALLATION MEETINGS

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

1.4 SUBMITTALS

- A. Product Data: For each type of product, including installation instructions.
- B. Shop Drawings: For traffic coatings.
 - 1. Include details for treating substrate joints and cracks, flashings, deck penetrations, and other termination conditions.
 - 2. Include plans showing layout of pavement markings, lane separations, and defined parking spaces. Indicate, with international symbol of accessibility, spaces allocated for people with disabilities.
- C. Samples for Initial Selection: For each type of exposed finish.
- D. Samples for Verification: For each type of exposed finish, prepared on rigid backing.
 - 1. Provide stepped Samples on backing to illustrate buildup of traffic coatings.
- E. Qualification Data: For Installer.
- F. Product Certificates: For each type of traffic coating.
- G. Field quality-control reports.
- H. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For traffic coatings to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Apply traffic coatings within the range of ambient and substrate temperatures recommended in writing by manufacturer. Do not apply traffic coatings to damp or wet substrates, when temperatures are below 40 deg F (5 deg C), when relative humidity exceeds 85 percent, or when temperatures are less than 5 deg F (3 deg C) above dew point.
 - 1. Do not apply traffic coatings in snow, rain, fog, or mist, or when such weather conditions are imminent during the application and curing period. Apply only when frost-free conditions occur throughout the depth of substrate.
- B. Do not install traffic coating until items that penetrate membrane have been installed.
- C. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 50 deg F (10 deg C) for water-based materials, and not exceeding 95 deg F (35 deg C).

1.8 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace traffic coating that fails in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Adhesive or cohesive failures.
 - b. Abrasion or tearing failures.
 - c. Surface crazing or spalling.
 - d. Intrusion of water, oils, gasoline, grease, salt, deicer chemicals, or acids into deck substrate.
 - 2. Warranty Period: Five (5) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Material Compatibility: Provide primers; base-, intermediate-, 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.
- B. Source Limitations:
 - 1. Obtain primary traffic-coating materials, including primers, from traffic-coating manufacturer. Obtain accessory materials including aggregates, sheet flashings, joint sealants, and substrate repair materials of types and from sources recommended in writing by primary material manufacturer.
 - 2. Obtain pavement-marking paint from single source from single manufacturer.

2.2 MANUFACTURERS

- A. Basis-of Design Manufacturer: Tremco; www.tremcosealants.com.
- B. Other Acceptable Manufacturers:
 - 1. BASF; www.basf.com.
 - 2. Dex-O-Tex, Div. of Crossfield Products Corp; www.dex-o-tex.com.
 - 3. Neogard, Div. of Hempel (USA), Inc.; www.neogard.com.
 - 4. Pecora Corp.; www.pecora.com.
 - 5. Sherwin-Williams Co.; www.sherwin-williams.com.

2.3 TRAFFIC COATING

- A. Traffic Coating, Pedestrian Traffic: Manufacturer's standard, traffic-bearing, seamless, high-solids-content, cold liquid-applied, elastomeric, waterproofing membrane system with integral wearing surface for vehicular traffic and equipment-room floor; according to ASTM C 957.
 - 1. Basis-of-Design Product: Terapro Unreinforced Pedestrian Traffic Waterproofing System by Siplast.
 - a. Color: As selected by Architect from manufacturer's full range.
 - 2. Primer: Two-component, chemically curing methyl methacrylate primer.
 - 3. Base Coat and Wear Coat: Modified polyurethane methacrylate by traffic-coating manufacturer.
 - 4. Top Coat: Methyl methacrylate by traffic-coating manufacturer.
 - 5. Aggregate: Manufacturer's standard aggregate for each use indicated of particle sizes, shape, and minimum hardness recommended in writing by traffic-coating manufacturer.
- B. 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.
 - 1. Class B roof covering per ASTM E 108 or UL 790.
- C. Solar Reflective Index (SRI): 29 or higher.

2.4 ACCESSORY MATERIALS

- A. Joint Sealants: ASTM C 920.
- B. Sheet Flashing: Nonstaining sheet material recommended in writing by traffic-coating manufacturer.
 - 1. Thickness: Minimum 60 mils (1.5 mm).
- C. Adhesive: Contact adhesive recommended in writing by traffic-coating manufacturer.
- D. Reinforcing Strip: Fiberglass mesh recommended in writing by traffic-coating manufacturer.
- E. Sheet Metal Flashing: Refer to requirements in Section 076200 "Sheet Metal Flashing and Trim".

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for surface smoothness, surface moisture, and other conditions affecting performance of traffic-coating work.
- B. Verify that substrates are visibly dry and free of moisture.
 - 1. Test for moisture content by method recommended in writing by traffic-coating manufacturer.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of traffic-coating work.
- D. Proceed with installation only after substrate construction and penetrating work have been completed and unsatisfactory conditions have been corrected.
 - 1. Begin coating application only after minimum concrete-curing and -drying period recommended in writing by traffic-coating manufacturer has passed and after substrates are dry.
 - 2. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. General: Before applying traffic coatings, 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. Remove projections, fill voids, and seal joints if any, as recommended in writing by traffic-coating manufacturer.
- B. Schedule preparation work so dust and other contaminants from process do not fall on wet, newly coated surfaces.
- C. 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.
- D. 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.

3.3 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.

3.4 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.

3.5 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. Start traffic-coating application in presence of manufacturer's technical representative.
- D. Verify that wet film thickness of each coat complies with requirements every 100 sq. ft. (9 sq. m).
- E. Uniformly broadcast aggregate on coats specified to receive aggregate. Embed aggregate according to manufacturer's written instructions. After coat dries, sweep away excess aggregate.
- F. Apply traffic coatings to prepared wall terminations and vertical surfaces to height indicated; omit aggregate on vertical surfaces.

- G. Cure traffic coatings. Prevent contamination and damage during application and curing stages.

3.6 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform the following field tests and inspections:
 - 1. Materials Testing:
 - a. Samples of material delivered to Project site shall be taken, identified, sealed, and certified in presence of Owner and Contractor.
 - b. Testing agency shall perform tests for characteristics specified, using applicable referenced testing procedures.
 - c. Testing agency shall verify thickness of coatings during traffic-coating application for each 600 sq. ft. (56 sq. m) of installed traffic coating or part thereof.
 - 2. Electronic Leak-Detection Testing (Over Occupied Spaces):
 - a. Testing agency shall test each deck area for leaks using an electronic leak-detection method that locates discontinuities in the traffic-coating membrane.
 - b. Testing agency shall perform tests on abutting or overlapping smaller areas as necessary to cover entire test area.
 - c. Testing agency shall create a conductive electronic field over the area of traffic coating to be tested and electronically determine locations of discontinuities or leaks, if any, in the traffic coating.
 - d. Testing agency shall provide survey report indicating locations of discontinuities, if any.
 - 3. If test results show traffic coating does not comply with requirements, remove and replace or repair the membrane as recommended in writing by traffic-coating manufacturer and make further repairs after retesting until traffic-coating installation passes.
- B. Final Traffic-Coating Inspection: Arrange for traffic-coating manufacturer's technical personnel to inspect membrane installation on completion.
 - 1. Notify Architect or Owner 48 hours in advance of date and time of inspection.
- C. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- D. Prepare test and inspection reports.

3.7 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

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SECTION 07 19 00 - WATER REPELLENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes:
 - 1. Interior and exterior, penetrating water-repellent, stain-resistant sealer for vertical and horizontal surfaces.
- B. Related Requirements:
 - 1. Section 03 30 00 "Cast-in-Place" for coordination of substrate preparation.

1.3 SUBMITTALS

- A. Product Data: For each type of product.
 - 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.
- B. Samples: For each type and color of water repellent and substrate indicated, 12 by 12 inches (300 by 300 mm) in size, with specified water-repellent treatment applied to half of each Sample.
- C. Preconstruction Test Reports: For water-repellent-treated substrates.
- D. Field quality-control reports.
- E. Sample Warranty: For special warranty.

1.4 QUALITY ASSURANCE

- A. Applicator Qualifications: An employer of workers trained and approved by manufacturer.
- B. Mockups: Prepare mockups of each required water repellent on each type of substrate required to demonstrate aesthetic effects and to set quality standards for materials and execution.
 - 1. Locate mockups on masonry sample panels.
 - 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.

1.5 PRECONSTRUCTION TESTING

- A. Preconstruction Testing: Engage a qualified testing agency to perform preconstruction testing of water repellents on field mockups.

1.6 FIELD 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. Concrete surfaces and mortar have 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 (4.4 deg C) and below 100 deg F (37.8 deg C) and will remain so for 24 hours.
 4. Substrate is not frozen and substrate-surface temperature is above 40 deg F (4.4 deg C) and below 100 deg F (37.8 deg C).
 5. Rain or snow is not predicted within 24 hours.
 6. Not less than 24 hours have passed since surfaces were last wet, or as required by manufacturer.
 7. Windy conditions do not exist that might cause water repellent to be blown onto vegetation or surfaces not intended to be treated.

1.7 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.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Manufacturers:
1. BP Pro; www.bprop.biz.
 2. Evonik Corp. USA; www.protectosil.com.
 3. Miracle Sealants; www.miraclesealants.com.
 4. Prosoco Inc.; www.prosoco.com.
- B. Other Approved Manufacturers:
1. Fabrikem; www.fabrikem.com.
 2. L&M Construction Chemicals; div. of Laticrete International, Inc.; www.laticrete.com.
 3. PPG Industries, Inc.; www.ppg.com.
 4. Sherwin Williams; www.sherwin-williams.com.
 5. Or approved equal.

2.2 INTERIOR WATER REPELLENTS

- A. Horizontal Concrete Surface Sealer: Silane/siloxane-blend, penetrating floor sealer, clear, proprietary blend with minimum 40% silane content; stain resistance with graffiti control; for areas subject to snow and freeze conditions.
1. Basis-of-Design Products: by Protectosil, Evonik Degussa Corporation USA; www.protectosil.com.
 - a. First Coat: Protectosil Chem-Trete 40 VOC.
 - b. Second Coat: Protectosil Aqua-Trete SG.
 2. Other Approved Products:
 - a. Masterprotect H400 by BASF; www.master-builder-solutions.basf.com.
 - b. Or approved equal.

2.3 EXTERIOR WATER REPELLENTS

- A. Concrete Vertical Surface Graffiti Control Treatment: Low-odor, VOC-compliant, colorless, non-staining, penetrating graffiti control treatment for vertical and horizontal concrete surfaces, containing 100 percent silane, for low temperature applications.
1. Basis-of-Design Product: Protectosil Antigraffiti by Evonik.
 - a. Or approved equal.
 2. Formulation: Polymeric fluorosilane.
 3. VOC: Less than 20 g/L.
 4. Other Approved Products: MasterSeal 581 by BASF; www.master-builder-solutions.basf.com.
- B. Concrete Vertical and Horizontal Sealer:
1. Basis-of-Design Product: SLX100 Water & Oil Repellent by Prosoco.
 - a. Or approved equal.
- C. Precast Concrete Vertical and Horizontal Sealer:
1. Basis-of-Design Product: StainBlocker by BP Pro.
 - a. Or approved equal.
- D. Stone Horizontal Sealer:
1. Basis-of-Design Product: 511 Porous Plus by Miracle Sealants.
 - a. Or approved equal.

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. Verify that there is no efflorescence or other removable residues that would be trapped beneath the application of water repellent.

3. 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.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Allow concrete and other cementitious materials to age before application of water repellent, according to repellent manufacturer's written instructions.
- B. Cleaning: Before application of water repellent, clean substrate of substances that could impair penetration or performance of product according to substrate and water-repellent manufacturer's written instructions.
- C. 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. Cover live vegetation.
- 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.
- B. Apply coating(s) of water repellent on surfaces to be treated per the manufacturer's written instructions for application procedure unless otherwise indicated.

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. Owner will engage the services of a qualified testing agency to sample water-repellent material being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.
 2. Testing agency will perform tests for compliance of water-repellent material with product requirements.
 3. 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

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SECTION 07 21 00 - THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Batt insulation (INSUL 2A and INSUL 2B).
 - 2. Polyisocyanurate nailbase insulation (INSUL 3).
 - 3. Loose-fill insulation (INSUL 4A).
 - 4. Insulation for miscellaneous voids.
 - 5. Vapor retarder.
- B. Related Requirements:
 - 1. Section 07 41 13 "Standing-Seam Metal Roof Panels" for roofing insulation.
 - 2. Section 09 29 00 "Gypsum Board" for sound attenuation blanket used as acoustic insulation.

1.3 SUBMITTALS

- A. Product Data: For each type of product.
- B. Product Test Reports: For each product, for tests performed by a qualified testing agency.

1.4 DEFINITIONS

- A. Mineral-Fiber Insulation: Insulation composed of rock-wool fibers, slag-wool fibers, or glass fibers; produced in boards and blankets with latter formed into batts (flat-cut lengths) or rolls.

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 until just before installation time.
 - 3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Source Limitations: Obtain each type of building insulation through one source.

- B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
 - 1. Surface-Burning Characteristics: One of the following standards shall apply:
 - a. ASTM E84 "Standard Test Method for Surface Burning Characteristics of Building Materials"
 - 2. Fire-Resistance Ratings: One of the following standard shall apply:
 - a. ASTM E119 "Standard Test Methods for Fire Tests for Building Construction and Materials"
 - b. ISO 834 - Parts 1 and 3-9 "Fire Resistance Tests - Elements of Building Construction."
 - 3. Combustion Characteristics: One of the following standards shall apply:
 - a. ASTM E136 "Standard Test method for Behavior of Materials in a Vertical Tube Furnace at 750 Degrees Celsius"
- C. Formaldehyde-Free: Batt insulation products shall not contain formaldehyde (or formaldehyde precursors). Provide Third Party Certification with UL Environmental Claim Validation; industries.ul.com.
- D. Recycled Content: Batt insulation products shall contain a minimum of 50 percent post-consumer recycled glass content. Provide UL Environmental Claim Validation; industries.ul.com.

2.2 BATT INSULATION

- A. Unfaced, Mineral-Wool Blanket Insulation, INSUL 2A: ASTM C665, Type IA (blankets without membrane facing); consisting of fibers; passing ASTM E136 for combustion characteristics.
 - 1. Basis-of-Design Product: EcoBatt (Unfaced) by Knauf; www.knaufinsulation.us.
 - 2. Other Acceptable Product:
 - a. Formaldehyde-Free Fiberglass Insulation by Johns Manville; www.johnsmanville.com.
 - b. Or approved equal.
- B. Reinforced-Foil Faced, Mineral-Wool Blanket Insulation, INSUL 2B: ASTM C665, Type III (reflective faced); Category 1 (membrane is a vapor barrier), faced with foil scrim, foil-scrim kraft, or foil-scrim polyethylene.
 - 1. Basis-of-Design Product: EcoBatt (Faced) by Knauf; www.knaufinsulation.us.
 - 2. Other Acceptable Product:
 - a. Formaldehyde-Free Fiberglass Insulation by Johns Manville; www.johnsmanville.com.
 - b. Or approved equal.

2.3 POLYISOCYANURATE NAIL BASE, INSUL 3

- A. Polyisocyanurate Board Glass-Fiber-Mat Faced and 7/16-inch OSB Nail Base: ASTM C1289, glass-fiber-mat faced, Type V.
 - 1. Basis-of-Design Product: Rmax Nailable Base-3; www.rmax.com.
 - a. Or approved equal.

2.4 LOOSE-FILL INSULATION, INSUL 4A

- A. Glass-Fiber Loose-Fill Insulation: ASTM C764, Type I for pneumatic application.
 - 1. Flame-Spread Index: Not more than 5 when tested in accordance with ASTM E84.
 - 2. Smoke-Developed Index: Not more than 5 when tested in accordance with ASTM E84.
 - 3. Minimum R-Value per Inch: R-28.
 - 4. Basis-of-Design Product: Truecomfort by CertainTeed Corporation; www.certainteed.com
 - 5. Other Approved Manufacturers: styro
 - a. Johns Manville; www.jm.com.
 - b. Knauf; www.knaufinsulation.us.
 - c. Or approved equal.

2.5 VAPOR RETARDER

- A. Sheet Vapor Retarder: Polyamide film vapor retarder for use with unfaced, vapor permeable glass fiber and mineral wool insulation in wall and ceiling cavities. Material shall have a permeance of 1 perm or less when tested to ASTM E 86, dry cup method and permeability shall increase to greater than 10 perms when tested to ASTM E 86, wet cup method.
 - 1. Water Vapor Permeance:
 - a. ASTM E 86, dry cup method: Maximum of 1.0 perm (57ng/Pa*s*m2).
 - b. ASTM E 86, wet cup method: Minimum of 10.0 perms (1144ng/Pa*s*m2).
 - 2. Fire Hazard Classification: ASTM E 84:
 - a. Maximum Flame Spread Index; 20.
 - b. Maximum Smoke Developed Index; 55.
 - 3. Basis-of-Design Product: MemBrain by CertainTeed, Div. of Saint Gobain; www.certainteed.com.
 - a. Application: Interior face of wood framed exterior walls and roofs.
- B. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.
- C. Adhesive for Vapor Retarders: Product recommended by vapor-retarder manufacturer and has demonstrated capability to bond vapor retarders securely to substrates indicated.

2.6 INSULATION FASTENERS

- A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position with self-locking washer in place.
 - 1. Plate: Perforated, galvanized carbon-steel sheet, 0.030 inch (0.762 mm) thick by 2 inches (50 mm) square.
 - 2. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch (2.67 mm) in diameter; length to suit depth of insulation.

- B. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- (0.41-mm-) thick galvanized-steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches (38 mm) square or in diameter.
 - 1. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in the following locations:
 - a. Ceiling plenums.
- C. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates without damaging insulation, fasteners, or substrates.

2.7 ACCESSORIES

- A. Insulation for Miscellaneous Voids:
 - 1. Glass-Fiber Insulation: ASTM C 764, Type II, loose fill; with maximum flame-spread and smoke-developed indexes of 5, per ASTM E 84.
 - 2. Spray Polyurethane Foam Insulation: ASTM C 1029, Type II, closed cell, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.
- B. Adhesive for Bonding Insulation: Product compatible with insulation and air and water barrier materials, and with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing insulation, or that interfere with insulation attachment.

3.2 INSTALLATION, GENERAL

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

3.3 INSTALLATION OF FOUNDATION WALL INSULATION

- A. Butt panels together for tight fit.
- B. Anchor Installation: Install board insulation on concrete substrates by adhesively attached, spindle-type insulation anchors as follows:
 - 1. Fasten insulation anchors to concrete substrates with insulation anchor adhesive according to anchor manufacturer's written instructions. Space anchors according to insulation manufacturer's written instructions for insulation type, thickness, and application.
 - 2. Apply insulation standoffs to each spindle to create cavity width indicated on Drawings between concrete substrate and insulation.
 - 3. After adhesive has dried, install board insulation by pressing insulation into position over spindles and securing it tightly in place with insulation-retaining washers, taking care not to compress insulation.

4. Where insulation will not be covered by other building materials, apply capped washers to tips of spindles.

- C. Adhesive Installation: Install with adhesive or press into tacky waterproofing or dampproofing according to manufacturer's written instructions.

3.4 INSTALLATION OF CAVITY-WALL INSULATION

- A. Polyisocyanurate Board: Install pads of adhesive spaced approximately 24 inches (610 mm) 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.

- B. Mineral-Wool Board Insulation: Install insulation fasteners 4 inches from each corner of board insulation, at center of board, and as recommended by manufacturer.

1. Fit courses of insulation between obstructions, with edges butted tightly in both directions, and with faces flush.
2. Press units firmly against inside substrates.

3.5 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

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

1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
3. Maintain 3-inch (76-mm) 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 (2438 mm), support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.

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

1. Glass-Fiber Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft. (40 kg/cu. m).
2. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.
 - a. 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.
 - b. After insulation is applied, make flush with face of studs by using method recommended by insulation manufacturer.

- C. Loose-Fill Insulation: Apply according to ASTM C 1015 and manufacturer's written instructions. Level horizontal applications to uniform thickness as indicated, lightly settle to uniform density, but do not compact excessively.

3.6 INSTALLATION OF VAPOR RETARDERS ON FRAMING

- A. Place vapor retarders on side of construction indicated on Drawings.
- B. Extend vapor retarders to extremities of areas to protect from vapor transmission. Secure vapor retarders in place with adhesives, vapor retarder fasteners, or other anchorage system as recommended by manufacturer. Extend vapor retarders to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.
- C. Seal vertical joints in vapor retarders over framing by lapping no fewer than two studs and sealing with vapor-retarder tape according to vapor-retarder manufacturer's written instructions. Locate all joints over framing members or other solid substrates.
- D. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarders.
- E. Repair tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarders.

3.7 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

SECTION 07 25 00 - WEATHER BARRIERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Self-adhering combination air barrier/ vapor retarders (WRB 3).
 - 2. Flexible flashing (MEMB FLASH 1, MEMB FLASH 2, MEMB FLASH 3 and MEMB WP 1).
- B. Related Sections:
 - 1. Section 03 30 00 "Cast-in-Place Concrete" for vapor retarders below concrete slabs-on-grade.
 - 2. Section 06 16 00 "Sheathing" for substrate preparation coordination.
 - 3. Section 07 21 00 "Thermal Insulation" for interior vapor retarders.

1.3 DEFINITIONS

- A. Combination Air Barrier/ Vapor Retarder: Air-tight barrier made of material that is water vapor impermeable to the degree specified, with sealed seams and with sealed joints to adjacent surfaces, to stop passage of air and to provide water vapor resistance at above-grade exterior walls and exterior soffits.
 - 1. Water Vapor Permeance: For purposes of conversion, $57.2 \text{ ng}/(\text{Pa sec sq m}) = 1 \text{ perm}$.
- B. Flexible Flashings: Materials to stop passage of water through above-grade joints between exterior walls and roof, joints around frames of openings in exterior walls, and joints between exterior walls and soffits.

1.4 REFERENCE STANDARDS

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency.
- B. AATCC Test Method 30 - Antifungal Activity, Assessment on Textile Materials: Mildew and Rot Resistance of Textile Materials.
- C. ASTM C 836 - Standard Specification for High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course.
- D. ASTM D 1970 - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
- E. ASTM D 4541 - Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers.
- F. ASTM E 96/E 96M - Standard Test Methods for Water Vapor Transmission of Materials.
- G. ICC-ES AC308 - Acceptance Criteria for Water-Resistive Barriers; ICC Evaluation Service, Inc.

1.5 SUBMITTALS

- A. Product Data: For each type of product.
 - 1. For building wrap, include data on air and water-vapor permeance based on testing according to referenced standards.
- B. Shop Drawings: For air-barrier assemblies.
 - 1. Show locations and extent of air-barrier materials, accessories, and assemblies specific to Project conditions.
 - 2. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
 - 3. Include details of interfaces with other materials that form part of air barrier.
- C. Manufacturer's Installation Instructions: Indicate preparation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Air-Barrier Performance: Air-barrier assembly and seals with adjacent construction shall be capable of performing as a continuous 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. (0.2 L/s x sq. m of surface area at 75 Pa), when tested according to ASTM E 2357.

2.2 COMBINATION AIR BARRIER/ VAPOR RETARDER, WRB 3

- A. Self-Adhering Weather Barrier: Self-adhered vapor permeable, water resistive air barrier consisting of a reinforced, modified polyolefin tri-laminate film surface with release liner on adhesive side and formulated for application with primer that complies with VOC limits.
 - 1. Basis-of-Design Product: Blueskin VP 160 by Henry; www.henry.com.
 - 2. Other Acceptable Manufacturers:
 - a. Cosella-Dorken; www.cosella-dorken.com.
 - b. Soprema; www.soprema.us.
 - c. VaproShield; www.vaproshield.com.
 - d. Or approved equal.
 - 3. Physical and Performance Properties:
 - a. Thickness: 23 mils (0.58 mm)
 - b. Air Permeance: Pass; per ASTM E2178. 0.003 cfm/ft² (0.0147 L/s x sq. m of surface area at 75-Pa).
 - c. Vapor Permeance: Minimum 29 perms per ASTM E 96.
 - d. Tensile Strength: As tested per ASTM D 882, as follows:
 - 1) 41 lbf / 182N MD.
 - 2) 29 lbf / 129N CD.

- e. Elongation: Pass; per ICC-ES AC48.
- f. Fire Propagation Characteristics: At construction taller than 40 feet (12 m) above grade, provide product passing NFPA 285 testing as part of an approved assembly.
- g. UV Resistance: Can be exposed to sunlight for 60 days according to manufacturer's written instructions and can be exposed to sunlight through openings in the rain-screen façade as detailed.

2.3 FLEXIBLE FLASHING

- A. Modified Bituminous Flashing: 40-mil- thick, self-adhering flashing consisting of 36 mils of rubberized asphalt laminated to a 4-mil- thick, cross-laminated polyethylene film with release liner on adhesive side.
 - 1. Basis-of-Design Product, MEMB FLASH 1: Blueskin TWF by Henry; www.us.henry.com.
 - a. Other Approved Products:
 - 1) CCW-705-TWF by Carlisle; www.carlileccw.com.
 - 2) Perm-A-Barrier by GCP Applied Technologies Inc.; www.gcpat.com.
 - 3) Or approved equal.
 - b. Flame Propagation Test: Materials and construction shall be as tested according to NFPA 285.
 - c. Thickness: 40 mils minimum.
 - d. Vapor Permeance: 0.03 perm maximum per ASTM E96.
 - e. In-Service Temperature: Between 25 and 60 degrees F.
- B. SBS Modified Bituminous Flashing, MEMB WP 1: 60-mil- thick, self-adhering flashing product consisting of rubberized asphalt laminated to a cross-laminated polyethylene film with release liner on adhesive side.
 - 1. Basis-of-Design Product: Blueskin WP 200 by Henry.
 - a. Or approved equal.
 - 2. Flame Propagation Test: Materials and construction shall be as tested according to NFPA 285.
 - 3. Thickness: 60 mils minimum.
 - 4. Vapor Permeance: 0.02 perm maximum per ASTM E96 Procedure B.
 - 5. In-Service Temperature: Up to 194 degrees F.
- C. Butyl Rubber Flashing: Composite, self-adhesive, thru-wall flashing product consisting of a pliable, butyl rubber compound, bonded to a high-density polyethylene film, aluminum foil or spunbonded polyolefin to produce an overall thickness as indicated below.
 - 1. Basis-of-Design Product, MEMB FLASH 2: WaterBlock Foil Face 40 by WaterBlock Building Systems; www.waterblocksystems.com.
 - a. Other Approved Manufacturers:
 - 1) Henry; www.us.henry.com.
 - 2) Carlisle; www.carlileccw.com.
 - 3) Poly Wall; www.poly-wall.com.
 - 4) Or approved equal.

2. Flame Propagation Test: Materials and construction shall be as tested according to NFPA 285.
 3. Thickness: 40 mils minimum.
 4. Vapor Permeance: 0.016 perm maximum per ASTM E96.
 5. In-Service Temperature: Up to 194 degrees F.
- D. Membrane Flashing, High-Temperature, MEMB FLASH 3: Self-adhered roofing underlayment with high-temperature softening point, weather barrier membrane consisting of three layers (SBS rubberized asphalt compound with polyethylene film on each face) with a slip-resistant top coating to produce an overall thickness 40 mils.
1. Basis-of-Design Product: Blueskin PE200HT High Temperature Roof Underlayment by Henry.
 - a. Or approved equal.
 2. Flame Propagation Test: Materials and construction shall be as tested according to NFPA 285.
 3. Thickness: 40 mils minimum.
 4. Vapor Permeance: 0.04 perm maximum per ASTM E96.
 5. In-Service Temperature: - 40 to 206 degrees F.
- E. Primer for Flexible Flashing: Product recommended in writing by flexible flashing manufacturer for substrate.
- F. Nails and Staples: Product recommended in writing by flexible flashing manufacturer and complying with ASTM F 1667.

2.4 SEALANTS

- A. Sealants and Backers: As recommended by weather barrier manufacturer or as indicated; refer to Section 07 92 00 "Sealants".
- B. Primers, Cleaners, and Other Sealant Materials: As recommended by sealant manufacturer, appropriate to application, and compatible with adjacent materials.

2.5 ADHESIVES

- A. Mastic Adhesive: Compatible with sheet seal and substrate, thick mastic of uniform knife grade consistency.
- B. Non-Curing Adhesive: Compatible with sheet seal and substrate, permanently non-curing.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that surfaces and conditions are ready to accept the work of this section.

3.2 PREPARATION

- A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.
- B. Clean and prime substrate surfaces to receive adhesives in accordance with manufacturer's instructions.

3.3 INSTALLATION

- A. Install materials according to air-barrier manufacturer's written instructions and details and according to recommendations in ASTM D 6135 to form a seal with adjacent construction and ensure continuity of air and water barrier.
 - 1. When ambient and substrate temperatures range between 25 and 40 deg F (minus 4 and plus 5 deg C), 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 (16 deg C).
 - 2. Unless manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry.
- B. Prepare, treat, and seal inside and outside corners and vertical and horizontal surfaces at terminations and penetrations with termination mastic and according to ASTM D 6135.
- C. 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.
- D. Apply and firmly adhere air-barrier sheets over area to receive air barrier. Accurately align sheets and maintain uniform 2-1/2-inch- (64-mm-) 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.
 - 2. Roll sheets firmly to enhance adhesion to substrate.
- E. Apply continuous air-barrier sheets over accessory strips bridging substrate cracks, construction, and contraction joints.
- F. Seal top of through-wall flashings to air-barrier sheet with an additional 6-inch- (150-mm-) wide, transition strip.
- G. Seal exposed edges of sheet at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.
- H. 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 transition strip on roofing membrane or base flashing so that a minimum of 3 inches (75 mm) of coverage is achieved over each substrate.
- I. Connect and seal exterior wall air-barrier sheet 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.
- J. At end of each working day, seal top edge of air-barrier material to substrate with termination mastic.
- K. 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.
- L. Wall Openings: Prime concealed, perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply so that a minimum of 3 inches (75 mm) of coverage is achieved over each substrate. Maintain 3 inches (75 mm) of contact over firm bearing to perimeter frames, with not less than 1 inch (25 mm) of full contact.
 - 1. Transition Strip: Roll firmly to enhance adhesion.

- M. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, doors, and miscellaneous penetrations of air-barrier material with foam sealant.
- N. Repair punctures, voids, and deficient lapped seams in air barrier. Slit and flatten fishmouths and blisters. Patch with air-barrier sheet extending 6 inches (150 mm) beyond repaired areas in all directions.
- O. Do not cover air barrier until it has been tested and inspected by testing agency.
- P. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air-barrier components.

3.4 FLEXIBLE FLASHING INSTALLATION

- A. Apply flexible flashing where indicated to comply with manufacturer's written instructions.
- B. Flexible Flashings/ Self-Adhering Underlayments: Install continuous air-tight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.
 - 1. Prime substrates as recommended by flashing manufacturer.
 - 2. Lap seams and junctures with other materials at least 4 inches except that at flashing flanges of other construction, laps need not exceed flange width.
 - 3. Lap flashing over water-resistive barrier at bottom and sides of openings.
 - 4. Lap water-resistive barrier over flashing at heads of openings.
 - 5. After flashing has been applied, roll surfaces with a hard rubber or metal roller to ensure that flashing is completely adhered to substrates.

3.5 FIELD QUALITY CONTROL

- A. ABAA Quality Assurance Program: Perform examinations, preparation, installation, testing, and inspections under ABAA's Quality Assurance Program.
- B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- C. 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 and concrete 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 (air barrier 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.
 - D. Tests: As determined by testing agency from among the following tests:
 1. Air-Leakage-Location Testing: Air-barrier assemblies will be tested for evidence of air leakage according to ASTM E 1186, chamber pressurization or depressurization with smoke tracers.
 2. Air-Leakage-Volume Testing: Air-barrier assemblies will be tested for air-leakage rate according to ASTM E 783 or ASTM E 2357.
 3. Adhesion Testing: Air-barrier assemblies will be tested for required adhesion to substrate according to ASTM D 4541 for each 600 sq. ft. of installed air barrier or part thereof.
 - E. 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.
 - F. Repair damage to air barriers caused by testing; follow manufacturer's written instructions.
 - G. Prepare test and inspection reports.
- 3.6 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 recommended in writing by manufacturer. If exposed to these conditions for longer than recommended, remove and replace air barrier or install additional, full-thickness, air-barrier application after repairing and preparing the overexposed materials 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 in writing by manufacturer of affected construction.

END OF SECTION

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SECTION 07 31 13 - ASPHALT SHINGLES

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. Asphalt shingles.
 - 2. Underlayment.
 - 3. Continuous ridge and between shingle rows vents.
- B. Related Requirements:
 - 1. Section 06 16 00 "Sheathing" for structural concrete decking used in shingle roofing assemblies.
 - 2. Section 07 92 00 "Joint Sealants" for coordination with sealants used in roofing assemblies.

1.3 DEFINITION

- A. Roofing Terminology: See ASTM D1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" for definitions of terms related to roofing work in this Section.

1.4 PREINSTALLATION MEETINGS

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

1.5 SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Of all transitions to flashings and gutters indicating installer's scope and coordination between other trades.
- C. Samples for Verification: For the following products, of sizes indicated:
 - 1. Asphalt Shingles: Full size.
 - 2. Ridge and Hip Cap Shingles: Full size.
 - 3. Continuous Ridge Vent: Full size.
- D. Qualification Data: For Installer.
- E. Product Test Reports: For each type of asphalt shingle and underlayment product indicated, for tests performed by manufacturer and witnessed by a qualified testing agency or a qualified testing agency.
- F. Evaluation Reports: For synthetic underlayment and high-temperature, self-adhering sheet underlayment, from ICC-ES or other testing and inspecting agency acceptable to authorities having jurisdiction, indicating that product is suitable for intended use under applicable building codes.
 - 1. Provide ICC-ES report indicating roof covering classification according to UL 790.
- G. Sample Warranty: For manufacturer's warranty.

1.6 CLOSEOUT SUBMITTALS

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

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Furnish where requested by Owner.
 - 2. Asphalt Shingles: 100 sq. ft. of each type, in unbroken bundles.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

1.9 DELIVERY, STORAGE, AND HANDLING

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

1.10 FIELD CONDITIONS

- A. Environmental Limitations: Install self-adhering sheet underlayment within the range of ambient and substrate temperatures recommended in writing by manufacturer.

1.11 WARRANTY

- A. Verify with Owner warranty periods prior to procurement.
- B. Manufacturer's Warranty: Manufacturer agrees to repair or replace asphalt shingles that fail within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Manufacturing defects.
 - 2. Material Warranty Period: Lifetime warranty.
 - 3. Wind-Speed Warranty Period: Asphalt shingles will resist blow-off or damage caused by wind speeds of up to wind speed indicated on Structural Drawings but not less than 101 mph (V-asd, nominal design wind speed per OSSC chapter 16), for a period of 10 years from date of Substantial Completion.
 - 4. Algae-Resistance Warranty Period: Asphalt shingles will not discolor for a period of 10 years from date of Substantial Completion.
 - 5. Workmanship Warranty Period: 25 years from date of Substantial Completion.
- C. Roofing Installer's Warranty: On warranty, signed by Installer, in which Installer agrees to repair or replace components of asphalt-shingle roofing that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Two (2) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Exterior Fire-Test Exposure: Provide asphalt shingles and related roofing materials identical to those of assemblies tested for Class A fire resistance according to ASTM E108 or UL 790 by Underwriters Laboratories or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing agency.
- B. Asphalt shingles, for the basis-of-design product indicated, shall comply with either ASTM D7158 Class G or H and ASTM D3161 Class F.
- C. Underlayments, where substitutions are proposed, shall be approved for use in UL-tested assemblies indicated on Drawings.

2.2 GLASS-FIBER REINFORCED ASPHALT SHINGLES

- A. Laminated-Strip Asphalt Shingles: ASTM D3462/D3462M, laminated, multi-ply overlay construction, glass-fiber reinforced, mineral-granule surfaced, and self-sealing.
 - 1. Approved Manufacturers:
 - a. CertainTeed; www.certainteed.com.
 - b. GAF; www.gaf.com.
 - c. Malarkey; malarkeyroofing.com.
 - d. Owens Corning; www.owenscorning.com.
 - e. TAMKO Building Products, LLC; www.tamko.com.
 - 2. Algae Resistance: Granules resist algae discoloration.
 - 3. Color: As selected by Architect.
- B. Hip and Ridge Shingles: Manufacturer's standard units to match specified shingles.
- C. Starter Shingles: Manufacturer's standard for performance indicated.

2.3 UNDERLAYMENT MATERIALS

- A. Synthetic Underlayment: UV-resistant polypropylene, polyolefin, or polyethylene polymer fabric with surface coatings or treatments to improve traction underfoot and abrasion resistance; evaluated and documented to be suitable for use as a roof underlayment under applicable codes by a testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Approved Manufacturers:
 - a. CertainTeed; www.certainteed.com.
 - b. GAF; www.gaf.com.
 - c. Malarkey; malarkeyroofing.com.
 - d. Owens Corning; www.owenscorning.com.
 - e. TAMKO Building Products, LLC; www.tamko.com.
 - 2. Provide primer as required for substrate preparation as required for direct-application over structural concrete deck panels as recommended by manufacturer.

2.4 ACCESSORIES

- A. Asphalt Roofing Cement: ASTM D4586, Type I, Class I, asbestos free. Compatible with underlayment, self-adhered flashing and roofing materials in contact with roofing cement.

- B. Roofing Nails: ASTM F1667; hot-dip galvanized-steel, shingle nails, 11-gauge wire, sharp-pointed, with a minimum 3/8-inch-diameter flat head; 1.20-inches long. Comply with roof deck manufacturer's requirements.
 - 1. Provide metal type suitable for use with substrate. Verify metal type with roof deck manufacturer for compatibility with fire-treatment materials.
 - 2. Shank: Barbed.
 - 3. Where nails are in contact with metal flashing, use stainless steel nails.
- C. Continuous Ridge Vent, Basis-of-Design Product:
 - 1. V-300 E Ridge Vents by Cor-A-Vent, Inc.; www.cor-a-vent.com.
 - 2. Or, approved substitution.
- D. Continuous Core Vent (between shingle rows at low end of roof slope), Basis-of-Design Product:
 - 1. IN-Vent by Cor-A-Vent, Inc.; www.cor-a-vent.com.
 - 2. Or, approved substitution.

2.5 METAL FLASHING AND TRIM

- A. General: Specified in Section 07 62 00 "Sheet Metal Flashing and Trim."
 - 1. Provide flashings indicated.
- B. Fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of the item. Unless otherwise indicated, comply with the following:
 - 1. Apron Flashings: Fabricate with lower flange a minimum of 4 inches over and 4 inches beyond each side of downslope asphalt shingles and 6 inches up the vertical surface.
 - 2. Cricket or Backer Flashings: Fabricate with concealed flange extending a minimum of 24 inches beneath upslope asphalt shingles and 6 inches beyond each side of penetrating structure and 6 inches above the roof plane.
 - 3. Drip Edges: Fabricate in lengths not exceeding 10 feet with 2-inch roof-deck flange and 1-1/2-inch fascia flange with 3/8-inch drip at lower edge.
 - 4. Gutters: Section 07 62 00 "Sheet Metal Flashing and Trim."
- C. Vent Pipe Flashings: ASTM B749, Type L51121, at least 1/16 inch thick. Provide lead sleeve sized to slip over and turn down into pipe, soldered to skirt at slope of roof, and extending at least 4 inches from pipe onto roof.
 - 1. Provide preformed pipe-boots, compatible with shingles and underlayment materials indicated. Include compatibility documentation with product during submittals where selected for use in lieu of lead sleeve flashings.

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.
 - 1. Examine roof sheathing to verify that sheathing joints are supported by framing and blocking or metal clips and that installation is within flatness tolerances.
 - 2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and completely anchored; and that provisions have been made for flashings and penetrations through asphalt shingles.

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

3.2 UNDERLAYMENT INSTALLATION

- A. General: Comply with underlayment manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.
- B. Self-Adhering Sheet Underlayment: Install, wrinkle free, on roof decks indicated. Comply with low-temperature installation restrictions of underlayment manufacturer if applicable. Install lapped in direction that sheds water. Lap sides not less than 3-1/2 inches. Lap ends not less than 6 inches staggered 24 inches between courses. Roll laps with roller. Cover underlayment within seven days.
 - 1. Prime surfaces to receive self-adhering sheet underlayment where required and recommended by manufacturer.
 - 2. Install underlayment on entire roof deck.
 - 3. Ridges: Extend without obstructing continuous ridge vent slot.
 - 4. Sidewalls: Return vertically against sidewall not less than 4 inches.
 - 5. Dormers, Chimneys, Skylights, and Other Roof-Penetrating Elements: Return vertically against penetrating element not less than 4 inches.

3.3 DECK INSTALLATION

- A. Comply with UL requirements for assembly indicated and Section 06 16 00 "Sheathing."

3.4 METAL FLASHING INSTALLATION

- A. General: Install metal flashings and other sheet metal to comply with requirements in Section 07 62 00 "Sheet Metal Flashing and Trim."
 - 1. Install metal flashings according to recommendations in ARMA's "Residential Asphalt Roofing Manual" and NRCA's "NRCA Guidelines for Asphalt Shingle Roof Systems."
- B. Apron Flashings: Extend lower flange over and beyond each side of downslope asphalt shingles and up the vertical surface.
- C. Step Flashings: Install with a head lap of 2 inches and extend over the underlying asphalt shingle and up the vertical surface. Fasten to roof deck only.
- D. Cricket or Backer Flashings: Install against the roof-penetrating element extending concealed flange beneath upslope asphalt shingles and beyond each side.
- E. Open-Valley Flashings: Install centered in valleys, lapping ends at least 8 inches in direction to shed water. Fasten upper end of each length to roof deck beneath overlap.
 - 1. Secure hemmed flange edges into metal cleats spaced 12 inches apart and fastened to roof deck.
 - 2. Adhere 9-inch-wide strip of self-adhering sheet to metal flanges and to self-adhering sheet underlayment.
- F. Rake Drip Edges: Install rake drip-edge flashings over underlayment and fasten to roof deck.
- G. Eave Drip Edges: Install eave drip-edge flashings below underlayment and fasten to roof sheathing.
- H. Pipe Flashings: Form flashing around pipe penetrations and asphalt shingles. Fasten and seal to asphalt shingles as recommended by manufacturer.

3.5 ASPHALT-SHINGLE INSTALLATION

- A. General: Install asphalt shingles according to manufacturer's written instructions, recommendations in ARMA's "Residential Asphalt Roofing Manual," and recommendations in NRCA's "NRCA Guidelines for Asphalt Shingle Roof Systems."
- B. Install starter strip along lowest roof edge, consisting of an asphalt-shingle strip at least 7 inches wide with self-sealing strip face up at roof edge.
 - 1. Extend asphalt shingles 1/2 inch over fasciae at eaves and rakes.
 - 2. Install starter strip along rake edge.
- C. Install first and remaining courses of asphalt shingles stair-stepping diagonally across roof deck with manufacturer's recommended offset pattern at succeeding courses, maintaining uniform exposure.
- D. Install first and remaining courses of asphalt shingles stair-stepping diagonally across roof deck with manufacturer's recommended offset pattern at succeeding courses, maintaining uniform exposure.
- E. Install asphalt shingles by single-strip column or racking method, maintaining uniform exposure. Install full-length first course followed by cut second course, repeating alternating pattern in succeeding courses.
- F. Fasten asphalt-shingle strips with number of roofing nails required for performance, located according to manufacturer's written instructions. Refer to roof deck manufacturer nailing requirements and recommendations for structural concrete decking.
 - 1. Where roof slope is less than 4:12, seal asphalt shingles with asphalt roofing cement spots.
 - 2. When ambient temperature during installation is below 50 deg F, seal asphalt shingles with asphalt roofing cement spots.
- G. Open Valleys: Cut and fit asphalt shingles at open valleys, trimming upper concealed corners of shingle strips. Maintain uniform width of exposed open valley from highest to lowest point.
 - 1. Set valley edge of asphalt shingles in a 3-inch-wide bed of asphalt roofing cement.
 - 2. Do not nail asphalt shingles to metal open-valley flashings.
- H. Hip and Ridge Shingles: Maintain same exposure of cap shingles as roofing shingle exposure. Lap cap shingles at ridges to shed water away from direction of prevailing winds. Fasten with roofing nails of sufficient length to penetrate sheathing.

END OF SECTION

SECTION 07 46 23 - WOOD SOFFITS

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. Furnish all labor, material, equipment, and services required for the installation of exterior wood siding and trim as detailed.
- B. Section Includes:
 - 1. Exterior composite wood soffits.
 - 2. Mill- or shop-application of finishes.
 - 3. Installation of flashing and caulking incidental to waterproofing treatments.
- C. Related Requirements:
 - 1. Section 06 10 00 "Rough Carpentry" for furring, blocking, and other carpentry work not exposed to view.
 - 2. Section 07 92 00 "Sheet Metal Flashing and Trim" for coordination of siding, soffit and trim with metal flashings.

1.3 REFERENCES

- A. West Coast Lumber Inspection Bureau (WCLIB) Standard Grading Rules No. 16 for West Coast Lumber.

1.4 SUBMITTALS

- A. Samples: Of all products indicated and required for complete installation.
 - 1. Soffit Boards: Three 12-inch long x full width boards, pre-stained with specified product and color for review of wood quality and stain color.

1.5 QUALITY ASSURANCE

- A. Integrated Exterior Mockups:
 - 1. Provide two 24 s.f. minimum wood siding mockups, one for each stain type, in locations as detailed or as directed by Architect.
 - 2. Approved mockups may become part of final work if undamaged at Substantial Completion. Remove unapproved mockups from site.
 - 3. Do not proceed with mill application of stain until the mockup has been approved by the Architect.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Wood Siding, General: Grade of siding as indicated, tongue-and-groove, blind nailed; shop-stained and shop-sealed at all sides; field-sealed at cut ends.

- B. Exterior Composite Wood Soffit:
 - 1. Basis-of-Design Product: Epic Cognac 1x6 RainClad Siding Shiplap Fused Bamboo by dassoXTR; dassoxtr.com.
 - a. Profiles: Tongue-and-groove profile as indicated in Drawings.
 - b. Item No.: EPC-SID18-137TG-PP.
 - c. Fire Rating: Class A.
 - d. Color: Cognac
 - e. Thickness: 3/4 inches.
 - f. Width: 6 inches.
- C. Exposed Fasteners: Exposed on surface of wood siding;
 - 1. Nails: ASTM F 1667; Type 304 stainless steel siding head with annular ring, length as required to penetrate solid framing by 1-inch, precoated with siding stain.
 - 2. Screws: Type 304 stainless steel; wing-tipped wafer head screws.
 - a. Basis-of-Design Product: HeadLOK Wafer-Head Spider Drive Heavy-Duty by FastenMaster; www.fastenmaster.com.
 - b. Corrosion Resistance: 1000 hours of salt spray test per ASTM B117 with no visible sign of surface red rust.
 - c. Length: Sufficient to penetrate a minimum of 1-1/4- inch into solid framing.
 - d. Spacing: As determined from SBC Research Institute, Technical Evaluation Report TER No. 1009-01.

2.2 FINISHES

- A. Mill- or Shop-Prestaining of Wood Soffits: Finish as selected by Architect.
- B. Apply one coat of stain to all surfaces of sanded wood siding components by mill dipping.

PART 3 - EXECUTION

3.1 PROTECTION

- A. Mill wrap all bundles and protect from dampness at all times. 12 percent moisture content maximum at time of installation.

3.2 EXAMINATION

- A. Examine substrate and site conditions under which work will be installed. Do not proceed with installation until unsatisfactory conditions have been corrected.
- B. Coordinate with installation of weather resistant barrier, refer to Section 07 25 00 "Weather Barriers" to ensure it is complete and ready for cover.

3.3 INSTALLATION

- A. Install furring strips as detailed using fasteners as specified for concealed fastening.
- B. Siding: Blind nail and face nail.
 - 1. Plan for least joints in each area with end joints well scattered in random locations so as to be inconspicuous. No lengths less than 6-feet long or full width of narrower spaces.
 - 2. Fasten boards with countersunk siding nail in face and in concealed tongue. At soffits, use countersunk flush screws. Locate fasteners above lap joints, do not fasten through laps.

Two fastener per board, into furring, into solid framing or furring at each attachment point, matching framing or furring spacing, at 16 inches o.c. maximum. Fasteners shall be positioned in neat, straight rows where exposed.

- C. Field Cuts: Make all field cuts on siding with fine tooth finishing saw. Restain cut ends and edges. Scarf cut all end splices and brush treat or prime all cut ends and edges with stain as used for mill treatment before installation of board.

3.4 SOFFIT INSTALLATION

- A. Install soffit to comply with manufacturer's written instructions and warranty requirements.
- B. Wood Soffit:
 - 1. Begin application at soffit corner, with tongue edge toward the prevailing weather/ wind direction in winter.
 - 2. Install subsequent courses with tongue-and-groove edges tightly fitted together. Nail at each furring member.
 - 3. Leave 1/8-inch (3-mm) gap at trim and corners unless otherwise recommended by manufacturer, and apply sealant.
 - 4. Butt joints only over framing or blocking, nailing top and bottom on each side and staggering joints in subsequent courses.
- C. Flashing: Install metal flashing as indicated on Drawings and as recommended by soffit manufacturer.
- D. Finish: Apply finish within two weeks of installation where field applied.

END OF SECTION

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SECTION 07 46 46 - FIBER-CEMENT SIDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Fiber-cement siding for exterior applications.
- B. Related Requirements:
 - 1. Section 06 10 00 "Rough Carpentry" for wood furring, grounds, nailers, and blocking.
 - 2. Section 07 62 00 "Sheet Metal Flashing and Trim" for flashings to be used in fiber-cement siding assemblies.
 - 3. Section 07 92 00 "Joint Sealants".

1.3 COORDINATION

- A. Coordinate siding installation with flashings and other adjoining construction to ensure proper sequencing.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. During the pre-construction meetings, review the approved design intent and methods required. Repeat this review during the preparation for assembly of the exterior systems mockup.

1.5 SUBMITTALS

- A. Product Data: For each type of product. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For fiber-cement siding. Include elevations, sections, full-size details, and attachment to other Work.
 - 1. Include details of transitions to other Work.
 - 2. Include joint pattern and horizontal and vertical joint details.
 - 3. Include fastener pattern for review for spacing. Include fastener type, size and material.
 - 4. Include expansion provisions.
 - 5. Include Project specific details.
- C. Samples for Verification: For each type, color, texture, and pattern required.
 - 1. 12-inch-long-by-actual-width Sample of siding.
 - 2. 24-inch-wide-by-36-inch-high Sample panel of siding assembled on plywood backing.
 - 3. 12-inch-long-by-actual-width Samples of trim and accessories.
- D. Product Certificates: For each type of fiber- cement siding and soffit.

- E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for fiber-cement siding.
- F. Research/Evaluation Reports: For each type of fiber-cement siding required, from ICC-ES.
- G. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of product, including related accessories, to include in maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

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

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: All products listed in this section are to be installed by a single installer trained and approved by the fiber-cement siding manufacture or manufacturer's representative.
- B. Color Evaluation: No visible change, 2000 hours of accelerated weathering with color evaluation when calculated to ASTM D2244.
- C. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and to set quality standards for fabrication and installation. Refer to Section 01 30 00 "Administrative Requirements".
 - 1. Build mockup of typical wall area as shown on Drawings.
 - a. Include outside corner on one end of mockup and inside corner on other end.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with labels intact until time of use.
- B. Store materials on elevated platforms, under cover, and in a dry location.

1.10 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits or which could involve life safety situations.
- B. Field Measurements: Verify actual measurements/openings by field measurements performed by the installer prior to fabrication. The General Contractor or Installer shall be responsible for existing site dimensions. Recorded measurements shall be indicated on shop drawings based on field measurements provided by the installer. Coordinate field measurements and fabrication schedule.

1.11 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace products that fail in materials within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including cracking and deforming.
 - b. Deterioration of materials beyond normal weathering.
 - 2. Warranty Period: 30 years from date of Substantial Completion for defects in materials when installation is by a contractor trained and approved by manufacturer's representative.
 - 3. Workmanship Warranty, Exterior: Application limited warranty for two (2) years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain products, including related accessories, from single source from single manufacturer for each type of fiber-cement siding indicated.
- B. Approved Manufacturers:
 - 1. Equitone Fibre Cement Facade Materials; www.equitone.com.
 - 2. James Hardie Building Products, Inc.; www.jameshardie.com.
 - 3. Nichiha USA, Inc.; www.nichiha.com.
 - 4. Or, approved substitution.

2.2 FIBER-CEMENT SIDING

- A. General: ASTM C1186 and EN 12467, fiber-cement board, noncombustible; with a flame-spread index of 25 or less when tested according to ASTM E84.
 - 1. Labeling: Provide fiber-cement siding that is tested and labeled according to ASTM C1186 or EN 12467 by a qualified testing agency acceptable to authorities having jurisdiction.
- B. Basis-of-Design Products, Panel: As selected by Architect.
 - 1. Texture: As selected.
 - 2. Thickness: As indicated.
 - 3. Width: As selected by Architect.
 - 4. Installation Orientation: Horizontal.
 - 5. Factory Priming: Manufacturer's standard acrylic primer.
 - a. Colors: By Sherwin-Williams Co., The; www.sherwin-williams.com.
 - 1) No.3: SW 6753 "Jargon Jade".
 - 2) No. 4: SW 6685 "Trinket".
 - 3) No. 5: SW 7584 "Red Theatre".
- C. Basis-of-Design Products, Lap Siding: As selected by Architect.
 - 1. Texture: As selected.
 - 2. Thickness: As indicated.
 - 3. Width: As selected by Architect.
 - 4. Installation Orientation: Horizontal.

5. Factory Priming: Manufacturer's standard acrylic primer.
 - a. Colors: By Sherwin-Williams Co., The; www.sherwin-williams.com.
 - 1) No.2: SW 7622 "Homburg Gray".

2.3 ACCESSORIES

- A. Siding Accessories, General: Provide starter strips, edge trim, outside and inside corner caps, and other items as recommended by siding manufacturer for building configuration and as required for complete installation.
 1. Provide accessories matching color and texture of adjacent siding unless otherwise indicated.
- B. Decorative Accessories: Provide the following fiber-cement decorative accessories as indicated:
 1. Corner posts.
 2. Door and window casings.
 3. Fasciae.
 4. Moldings and trim.
- C. Flashing: Provide flashing and trim complying with Section 07 62 00 "Sheet Metal Flashing and Trim" where indicated.
- D. Fasteners: Exposed fasteners.
 1. Exterior: Siding nails of sufficient length to penetrate a minimum of 1 inch into substrate.
 2. For fastening fiber cement, use stainless-steel fasteners at exterior.
- E. Insect Screen: Provide at sills and bottom of walls, where indicated.
 1. Basis-of-Design Manufacturer: Cor-A-Vent; www.cor-a-vent.com.
 2. As recommended by siding manufacturer for application.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

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

3.3 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.
 1. Do not install damaged components.
 2. Provide trim profiles where indicated.
 3. Vent bottom of wall assemblies with continuous metal, perforated vent.
 4. Fill face of countersink screws with patch material recommended by manufacturer, sand smooth and paint material to match color of fiber-cement siding.

- B. Install joint sealants as recommended by siding manufacturer, where indicated, and as specified in Section 07 92 00 "Joint Sealants."
- C. Align panels horizontally with panel stripes not varying more than 1/32 inch between panels, and 1/8 inch in 10 feet, non-cumulative.

3.4 ADJUSTING AND CLEANING

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

END OF SECTION

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SECTION 07 54 19 - POLYVINYL-CHLORIDE (PVC) ROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

1. Fully adhered PVC (polyvinyl chloride) roofing system, including rib profile.
2. Substrate boards.
3. Vapor barrier.
4. Roof insulation.
5. Cover board.
6. Fluid applied membrane flashing, PMMA flashing.
7. Walkways.

- B. Related Requirements:

1. Section 07 62 00 "Sheet Metal Flashing and Trim" for metal roof flashings and counterflashings.
2. Section 07 92 00 "Joint Sealants" for joint sealants, joint fillers, and joint preparation.

1.3 DEFINITIONS

- A. Roofing Terminology: Definitions in ASTM D 1079 and glossary in NRCA's "The NRCA Roofing Manual: Membrane Roof Systems" apply to work of this Section.

1.4 PREINSTALLATION MEETINGS

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

1. Meet with Owner, Architect, Construction Manager, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, air barrier 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 affects roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.

9. Review roof observation and repair procedures after roofing installation.

1.5 SUBMITTALS

- A. Product Data: For each type of product.
 1. For insulation and roof system component fasteners.
- B. Shop Drawings: Include roof plans, sections, details, and attachments to other work, including the following:
 1. Layout and thickness of insulation.
 2. Base flashings and membrane terminations.
 3. Flashing details at penetrations.
 4. Insulation Plans: Provide Project-specific plans showing tapered layout including thickness and slopes, crickets, and showing all unique conditions.
 5. Roof plan showing orientation of steel roof deck and orientation of roof membrane, fastening spacings, and patterns for mechanically fastened roofing system.
 6. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
 7. Tie-in with air barrier and other building-envelope transitions.
- C. Wind Uplift Resistance Submittal: For roofing system, indicating compliance with wind uplift performance requirements.
- D. Qualification Data: For Installer and manufacturer.
- E. Manufacturer Certificates:
 1. Performance Requirement Certificate: Signed by roof membrane manufacturer, certifying that roofing system complies with requirements specified in "Performance Requirements" Article.
 - a. Submit evidence of compliance with performance requirements.
 2. Special Warranty Certificate: Signed by roof membrane manufacturer, certifying that all materials supplied under this Section are acceptable for special warranty.
- F. Product Test Reports: For roof membrane and insulation, tests performed by independent qualified testing agency indicating compliance with specified requirements.
- G. Evaluation Reports: For components of roofing system, from ICC-ES.
- H. Field Test Reports:
 1. Concrete internal relative humidity test reports.
 2. Fastener-pullout test results and manufacturer's revised requirements for fastener patterns.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer that is UL listed for roofing system identical to that used for this Project.
- B. 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 special warranty.

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, approval or listing agency markings, and directions for storing and mixing with other components.
- B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
 - 1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.
- C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.
- D. Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck.

1.8 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.9 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period.
 - 1. Special warranty includes roof membrane, base flashings, roof insulation, fasteners, cover boards, and other components of roofing system.
 - 2. Warranty Period: 20 years from date of Substantial Completion.
- B. Special Project Warranty: Submit roofing Installer's warranty, on warranty form at end of this Section, signed by Installer, covering the Work of this Section, including all components of roofing system such as roof membrane, base flashing, roof insulation, fasteners, cover boards, vapor barriers, and walkway products, for the following warranty period:
 - 1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Installed roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roof system and flashings shall remain watertight.
 - 1. Accelerated Weathering: Roof membrane shall withstand 2000 hours of exposure when tested according to ASTM G 152, ASTM G 154, or ASTM G 155.
 - 2. Impact Resistance: Roof membrane shall resist impact damage when tested according to ASTM D 3746, ASTM D 4272/D 4272M.
- B. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roof membrane manufacturer based on testing and field experience.

- C. Roofing System Design: The completed membrane roofing system shall meet or exceed Project and code requirements. IBC uplift pressures shall be calculated in accordance with ASCE-7-10 "Minimum Design Loads for Buildings and Other Structures", but not less than the pressures calculated using Allowable Stress Design (ASD) by roofing manufacturer and the following:
 - 1. Design Data:
 - b. Basic Wind Speed, Ultimate: As indicated.
 - c. Exposure Category: As indicated.
 - 2. Manufacturer shall submit the zone pressure values for each roofing elevation in Project shown below, as indicated on the Structural Drawings.
 - 3. Pressure Zones: Submit in psf, for.
 - a. Field-of-Roof Uplift Pressure (Zone 1).
 - b. Perimeter Uplift Pressure (Zone 2).
 - c. Corner Uplift Pressure (Zone 3).
- D. Exterior Fire-Test Exposure: ASTM E 108 or UL 790, Class C; for application and roof slopes indicated; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- E. Fire-Resistance Ratings: Comply with fire-resistance-rated assembly designs indicated. Identify products with appropriate markings of applicable testing agency.
- F. Thermal Performance: R-21 minimum, continuous. Minimum taper may be accounted for in overall thickness.

2.2 POLYVINYL CHLORIDE (PVC) ROOFING

- A. Source Limitations: Obtain components for roofing system from roof membrane manufacturer.
- B. PVC Sheet: ASTM D4434, Type II, glass-fiber reinforced with adhesive backing; felt backed for adhered membranes besides self-adhered.
 - 1. Basis-of-Design Product: VersiFlex PVC Adhered Roofing System by Versico Roofing Systems, div. of Carlisle Construction Materials; www.versico.com.
 - 2. Membrane Thickness: 60 mils minimum.
 - 3. Color: As selected by Architect.
 - 4. Installation Type: Self-adhered membrane; fully adhered system.
- C. PVC Rib Profile: Provide manufacturer's standard adhered contour rib to achieve standing-seam appearance.
 - 1. Basis-of-Design Product: VersiFlex PVC Rib Profile by Versico Roofing Systems.

2.3 AUXILIARY ROOFING MATERIALS

- A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with other roofing components.
 - 1. Adhesives and Sealants: Comply with VOC limits of authorities having jurisdiction.
- B. Sheet Flashing: Manufacturer's standard sheet flashing of same material, type, reinforcement, thickness, and color as PVC sheet.
- C. Prefabricated Pipe Flashings: As recommended by roof membrane manufacturer.
- D. Bonding Adhesive: Manufacturer's standard, water based.

- E. Water-Based, Fabric-Backed Membrane Adhesive: Roofing system manufacturer's standard water-based, cold-applied adhesive formulated for compatibility and use with fabric-backed membrane roofing.
- F. Slip Sheet: Manufacturer's standard, of thickness required for application.
- G. Metal Termination Bars: Manufacturer's standard, predrilled stainless steel or aluminum bars, approximately 1 by 1/8 inch thick; with anchors.
- H. Metal Battens: Manufacturer's standard, aluminum-zinc-alloy-coated or zinc-coated steel sheet, approximately 1 inch wide by 0.05 inch thick, prepunched.
- I. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance and acceptable to roofing system manufacturer.
- J. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.

2.4 SUBSTRATE BOARDS

- A. Substrate Board: Where indicated. ASTM C1177/C1177M, glass-mat, water-resistant gypsum substrate or ASTM C1278/C1278M, fiber-reinforced gypsum board. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3273.
 - 1. Basis-of-Design Product: DensDeck Prime by Georgia Pacific, or product approved by membrane manufacturer.
 - 2. Thickness: 5/8 inch unless otherwise indicated.
 - 3. Surface Finish: Unprimed; primed where required for vapor retarder.

2.5 VAPOR BARRIER

- A. Self-Adhering-Sheet Vapor Barrier: Polyethylene film laminated to layer of butyl rubber adhesive, minimum 30-mil-total thickness; maximum permeance rating of 0.1 perm; cold applied, with slip-resisting surface and release paper backing. Provide primer when recommended by vapor barrier manufacturer.
 - 1. Vapor Retarder SA 31 by Sika.

2.6 ROOF INSULATION

- A. General: Preformed roof insulation boards manufactured or approved by PVC roof membrane manufacturer.
- B. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class 2, Grade 2, felt or glass-fiber mat facer on both major surfaces. Provide grade 3 at overburden assemblies.
 - 1. Size: Standard for specified requirements.
 - 2. Thickness:
 - a. Base Layer: 1-1/2 inches.
 - a. Upper Layer: As required for performance indicated.
- C. Tapered Insulation: Provide factory-tapered insulation boards.
 - 1. Material: Match roof insulation.
 - 2. Minimum Thickness: 1/4 inch.
 - 3. Slope:
 - a. Roof Field: 1/4 inch per foot (1:48) unless otherwise indicated on Drawings.

- b. Saddles and Crickets: 1/2 inch per foot (1:24) unless otherwise indicated on Drawings.

2.7 INSULATION ACCESSORIES

- A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with other roofing system components.
- B. Fasteners: Factory-coated steel fasteners and metal or plastic plates acceptable to roofing system manufacturer.
- C. Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach roof insulation to substrate or to another insulation layer as follows:
 - 1. Bead-applied, low-rise, one-component or multicomponent urethane adhesive.
 - 2. Full-spread, spray-applied, low-rise, two-component urethane adhesive.
- D. Cover Board: ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum board or ASTM C 1278/C 1278M fiber-reinforced gypsum board.
 - 1. Basis-of-Design Product: DensDeck Prime by Georgia Pacific, or product approved by membrane manufacturer.
 - 2. Thickness: 1/2 inch, unless otherwise indicated.
 - 3. Surface Finish: Primed.

2.8 LIQUID MEMBRANE FLASHING

- A. Liquid Applied Flashing: Manufacturer's standard, two-part two-component polymethyl methacrylate-based (PMMA) liquid flashing system with reinforcing; compatible with roofing membrane. Provide manufacturer's recommended accessories and transitions.
 - 1. Basis-of-Design Product: Sika Liquid Flashing.
 - 2. Color: Match roofing membrane where exposed.

2.9 WALKWAYS

- A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, slip-resisting, surface-textured walkway pads or rolls, approximately 3/16 inch thick and acceptable to roofing system manufacturer.
 - 1. Size: Approximately 36 by 60 inches.
 - 2. Color: Contrasting with roof membrane.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
 - 1. Verify that roof openings and penetrations are in place, curbs are set and braced, and roof-drain bodies are securely clamped in place.
 - 2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
 - 3. Verify that surface plane flatness and fastening of steel roof deck complies with requirements in Section 05 31 00 "Steel Decking."

4. Verify that any damaged sections of cementitious wood-fiber decks have been repaired or replaced.
 5. Verify that adjacent cementitious wood-fiber panels are vertically aligned to within 1/8 inch at top surface.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing system installation according to roofing system manufacturer's written instructions. Remove sharp projections.
- B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.
- C. Perform fastener-pullout tests according to roof system manufacturer's written instructions.
1. Submit test result within 24 hours of performing tests.
 - a. Include manufacturer's requirements for any revision to previously submitted fastener patterns required to achieve specified wind uplift requirements.
- D. Install sound-absorbing insulation strips according to acoustical roof deck manufacturer's written instructions.

3.3 ROOFING INSTALLATION, GENERAL

- A. Install roofing system according to roofing system manufacturer's written instructions.
- B. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at end of workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.
- C. Install roof membrane and auxiliary materials to tie in to existing roofing to maintain weathertightness of transition.
- D. Coordinate installation and transition of roofing system component serving as an air barrier with air barrier specified under Section 07 25 00 "Weather Barriers."

3.4 SUBSTRATE BOARD INSTALLATION

- A. Install substrate board with long joints in continuous straight lines, with end joints staggered not less than 24 inches in adjacent rows.
1. At steel roof decks, install substrate board at right angle to flutes of deck.
 - a. Locate end joints over crests of steel roof deck.
 2. Tightly butt substrate boards together.
 3. Cut substrate board to fit tight around penetrations and projections, and to fit tight to intersecting sloping roof decks.
 4. Fasten substrate board to top flanges of steel deck to resist uplift pressure at corners, perimeter, and field of roof according to roofing system manufacturers' written instructions for performance indicated.

3.5 VAPOR BARRIER INSTALLATION

- A. Self-Adhering-Sheet Vapor Barrier: Prime substrate if required by manufacturer. Install self-adhering-sheet vapor barrier over area to receive vapor barrier, side and end lapping each sheet a minimum of 3-1/2 and 6 inches (90 and 150 mm), respectively.
 - 1. Extend vertically up parapet walls and projections to a minimum height equal to height of insulation and cover board.
 - 2. Seal laps by rolling.
- B. Completely seal vapor barrier at terminations, obstructions, and penetrations to prevent air movement into roofing system.
- C. Extend up vertical surfaces for transitional tie-in to roof membrane and continuation of air barrier at parapet.

3.6 INSULATION INSTALLATION

- A. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at end of workday.
- B. Comply with roofing system and insulation manufacturer's written instructions for installing roof insulation.
- C. Installation Over Metal Decking:
 - 1. Install base layer of insulation with joints staggered not less than 24 inches in adjacent rows.
 - a. Locate end joints over crests of decking.
 - b. Where installing composite and noncomposite insulation in two or more layers, install noncomposite board insulation for bottom layer and intermediate layers, if applicable, and install composite board insulation for top layer.
 - c. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
 - d. Make joints between adjacent insulation boards not more than 1/4 inch in width.
 - e. At internal roof drains, slope insulation to create a square drain sump with each side equal to the diameter of the drain bowl plus 24 inches.
 - 1) Trim insulation so that water flow is unrestricted.
 - f. Fill gaps exceeding 1/4 inch with insulation.
 - g. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
 - h. Loosely lay base layer of insulation units over substrate.
 - i. Mechanically attach base layer of insulation using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to metal decks.
 - 2) Fasten insulation to resist specified uplift pressure at corners, perimeter, and field of roof.
 - 2. Install upper layers of insulation and tapered insulation with joints of each layer offset not less than 12 inches from previous layer of insulation.
 - a. Staggered end joints within each layer not less than 24 inches in adjacent rows.
 - b. Install with long joints continuous and with end joints staggered not less than 12 inches in adjacent rows.

- c. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
- d. Make joints between adjacent insulation boards not more than 1/4 inch in width.
- e. At internal roof drains, slope insulation to create a square drain sump with each side equal to the diameter of the drain bowl plus 24 inches.
- f. Trim insulation so that water flow is unrestricted.
- g. Fill gaps exceeding 1/4 inch with insulation.
- h. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
- i. Loosely lay each layer of insulation units over substrate.
- j. Adhere each layer of insulation to substrate using adhesive according to performance requirements, as follows:
 - 1) Set each layer of insulation in a solid mopping of hot roofing asphalt, applied within plus or minus 25 deg F (14 deg C) of equiviscous temperature.
 - 2) Set each layer of insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.
 - 3) Set each layer of insulation in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.

3.7 INSTALLATION OF COVER BOARDS

- A. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches in each direction.
 - 1. Trim cover board neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
 - 2. At internal roof drains, conform to slope of drain sump.
 - a. Trim cover board so that water flow is unrestricted.
 - 3. Cut and fit cover board tight to nailers, projections, and penetrations.
 - 4. Adhere cover board to substrate using adhesive according to performance requirements:
 - a. Set cover board in a solid mopping of hot roofing asphalt, applied within plus or minus 25 deg F (14 deg C) of equiviscous temperature.
 - b. Set cover board in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.
 - c. Set cover board in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.

3.8 ADHERED ROOFING INSTALLATION

- A. Adhere roof membrane over area to receive roofing according to roofing system manufacturer's written instructions.
- B. Unroll roof membrane and allow to relax before installing.
- C. Start installation of roofing in presence of roofing system manufacturer's technical personnel.
- D. Accurately align roof membrane, and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

- E. Bonding Adhesive: Apply to substrate and underside of roof membrane at rate required by manufacturer, and allow to partially dry before installing roof membrane. Do not apply to splice area of roof membrane.
- F. Fabric-Backed Roof Membrane Adhesive: Apply to substrate at rate required by manufacturer, and install fabric-backed roof membrane.
- G. In addition to adhering, mechanically fasten roof membrane securely at terminations, penetrations, and perimeter of roofing.
- H. Apply roof membrane with side laps shingled with slope of roof deck where possible.
- I. Seams: Clean seam areas, overlap roofing, and hot-air weld side and end laps of roof membrane and sheet flashings 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 roof membrane and sheet flashings.
 - 2. Verify field strength of seams a minimum of twice daily, and repair seam sample areas.
 - 3. Repair tears, voids, and lapped seams in roof membrane that do not comply with requirements.
- J. Spread sealant bed over deck-drain flange at roof drains, and securely seal roof membrane in place with clamping ring. Seal drain body and perimeter of roof drain termination with liquid flashing.

3.9 BASE FLASHING INSTALLATION

- A. Install sheet flashings and preformed flashing accessories, and adhere to substrates according to roofing system manufacturer's written instructions.
- B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate, and allow to partially dry. Do not apply to seam area of flashing.
- C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.
- D. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.
- E. Apply liquid flashing to terminations and transitions where not heat welded.
- F. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.10 LIQUID FLASHING

- A. Apply liquid flashing following manufacturer's instructions at roofing penetrations where preformed pipe boots are not utilized and for penetrations with irregular shapes and where specified elsewhere.

3.11 WALKWAY INSTALLATION

- A. Flexible Walkways: Install walkway products according to manufacturer's written instructions.
 - 1. Provide 6-inch clearance between adjoining pads.
 - 2. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

- B. Roof-Paver Walkways: Install walkway roof pavers according to manufacturer's written instructions.
 - 1. Install roof paver walkways at the following locations:
 - a. Perimeter of each rooftop unit.
 - b. Between each rooftop unit location, creating a continuous path connecting rooftop unit locations.
 - c. Between each roof hatch and each rooftop unit location or path connecting rooftop unit locations.
 - d. Top and bottom of each roof access ladder.
 - e. Between each roof access ladder and each rooftop unit location or path connecting rooftop unit locations.
 - f. Locations indicated on Drawings.
 - g. As required by roof membrane manufacturer's warranty requirements.
 - 2. Provide 3 inches of space between adjacent roof pavers.

3.12 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to inspect substrate conditions, surface preparation, roof membrane application, sheet flashings, protection, and drainage components, and to furnish reports to Architect.
- B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion, in presence of Architect, and to prepare inspection report.
- C. Repair or remove and replace components of roofing system where inspections indicate that they do not comply with specified requirements.
- D. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.13 PROTECTING AND CLEANING

- A. Protect roofing system from damage and wear during remainder of construction period. When remaining construction does not affect or endanger roofing, inspect roofing system 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 roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.
- C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

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SECTION 07 62 00 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following sheet metal flashing and trim:
 - 1. Formed copings.
 - 2. Manufactured reglets.
 - 3. Formed roof-drainage sheet metal fabrications (SHT MTL GUTTER).
 - 4. Formed low-slope roof flashing and trim.
 - 5. Formed wall flashing and trim.
 - 6. Flashing at door and window openings.
 - 7. Formed equipment support flashing.
 - 8. Formed overhead piping safety pans.
- B. Related Requirements:
 - 1. Section 07 25 00 "Weather Barriers" for self-adhered membrane flashing behind sheet metal flashings.
 - 2. Section 07 92 00 "Joint Sealants" for sealants used between sheet metal flashing and trim and other materials.

1.3 PERFORMANCE REQUIREMENTS

- A. General: Install sheet metal flashing and trim to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failing, rattling, leaking, and fastener disengagement.
- B. Fabricate and install roof edge flashing and copings capable of resisting the climatic and geographical wind velocity pressure and uplift forces.
- C. Thermal Movements: Provide sheet metal flashing and trim that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of sheet metal and trim thermal movements. 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 (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- D. Water Infiltration: Provide sheet metal flashing and trim that do not allow water infiltration to building interior.

1.4 SUBMITTALS

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

- B. Shop Drawings: Show layouts of sheet metal flashing and trim, including plans and elevations. Distinguish between shop- and field-assembled work. Include the following:
 - 1. Identify material, thickness, weight, and finish for each item and location in Project.
 - 2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.
 - 3. Details for fastening, joining, supporting, and anchoring sheet metal flashing and trim, including fasteners, clips, cleats, and attachments to adjoining work.
- C. Compatibility Letter and Chart:
 - 1. Provide a compatibility letter certifying physical and chemical compatibility of products in this section with all other dampproofing, waterproofing, weather barrier, roofing, self-adhered flashing and sealant products in the Project. Coordinate with the following Sections:
 - a. Section 07 11 13 "Bituminous Dampproofing".
 - b. Section 07 17 00 "Bentonite Waterproofing".
 - c. Section 07 25 00 "Weather Barriers".
 - 2. Provide input from this section toward a single Compatibility Chart to be compiled by the General Contractor. Compatibility Chart shall indicate 1) All dampproofing, waterproofing, weather barrier, roofing, self-adhered flashing and sealant products, 2) Which other products from this group they interface (are in contact with) in the Project, and 3) The physical and chemical compatibility between those interfaced products.
- D. Samples for Initial Selection: For each type of sheet metal flashing and trim indicated with factory-applied color finishes.
 - 1. Include similar Samples of trim and accessories involving color selection.

1.5 QUALITY ASSURANCE

- A. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual." Conform to dimensions and profiles shown unless more stringent requirements are indicated.
 - 1. Meet with Installer, and installers whose work interfaces with or affects sheet metal flashing and trim including installers of roofing materials, roof accessories, unit skylights, and roof-mounted equipment.
 - 2. Review methods and procedures related to sheet metal flashing and trim.
 - 3. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
 - 4. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver sheet metal flashing materials and fabrications undamaged. Protect sheet metal flashing and trim materials and fabrications during transportation and handling.
- B. Unload, store, and install sheet metal flashing materials and fabrications in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack materials on platforms or pallets, covered with suitable weathertight and ventilated covering. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage.

1.7 COORDINATION

- A. Coordinate installation of sheet metal flashing and trim with interfacing and adjoining construction to provide a leakproof, secure, and noncorrosive installation.

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. SPRI Wind Design Standard: Manufacture and install copings and roof edge flashings tested according to SPRI ES-1 and capable of resisting the following design pressure:
 - 1. Design Pressure: As indicated on Drawings.
- D. 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. Provide sheet metal components and accessories as indicated in the Drawings, identified as the following: SHT MTL FLASHING, SHT MTL GRAVEL STOP, SHT MTL SKIRT FLASHING, SHT MTL TRIM, SHT MTL FASCIA and others as indicated.
- B. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.
- C. Aluminum Sheet: ASTM B 209 (ASTM B 209M), alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required; with smooth, flat surface.
- D. Stainless-Steel Sheet: ASTM A 240/A 240M, or ASTM A 666, Type 304, dead soft, fully annealed; with smooth, flat surface.
- E. Metallic-Coated Steel Sheet: Provide zinc-coated (galvanized) steel sheet according to ASTM A 653/A 653M, G90 Z275 coating designation or aluminum-zinc alloy-coated steel sheet according to ASTM A 792/A 792M, Class AZ50 Class AZM150 coating designation, Grade 40Grade 275; prepainted by coil-coating process to comply with ASTM A 755/A 755M.
 - 1. Prepainted Finishes: Refer to Finishes articles below.

2.3 UNDERLAYMENT MATERIALS

- A. Underlayment Accessories: As indicated in SMACNA details:
 - 1. Polyethylene Sheet: 6 mils (0.15-mm) thick polyethylene sheet complying with ASTM D 4397.
 - 2. Felts: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, nonperforated.
 - 3. Slip Sheet: Rosin-sized paper, minimum 3 lb/100 sq. ft. (0.16 kg/sq. m).

2.4 FASTENERS

- A. General: Provide materials and types of fasteners and other miscellaneous items as required for complete sheet metal flashing and trim installation.
- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads.
 - 1. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws, gasketed, with hex washer head.
 - 2. Blind Fasteners: High-strength aluminum or stainless-steel rivets.
 - 3. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.
 - 4. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
 - 5. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.
 - 6. Fasteners for Zinc-Tin Alloy-Coated Stainless-Steel Sheet: Series 300 stainless steel.
 - 7. Fasteners for Steel Sheet: Series 300 stainless steel or hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

2.5 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation.
- B. Solder for Stainless Steel: ASTM B 32, Grade Sn60, with acid flux of type recommended by stainless-steel sheet manufacturer.
- C. Sealing Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealing tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape.
- D. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane or silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- E. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant, polyisobutylene plasticized, heavy bodied for hooked-type joints with limited movement.
- F. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.
- G. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 16 mils (0.4-mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.
- H. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.6 MANUFACTURED SHEET METAL FLASHING AND TRIM

- A. Reglets: Units of type, material, and profile indicated, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated with factory-mitered and -welded corners and junctions.
 - 1. Material: Stainless steel, 0.019 inch (0.5 mm thick); Copper, 16 oz./sq. ft. (0.55 mm) thick; Aluminum, 0.024 inch (0.61 mm) thick; Galvanized steel, 0.022 inch (0.55 mm) thick.
 - 2. Surface-Mounted Type: Provide with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.

3. Concrete Type: Provide temporary closure tape to keep reglet free of concrete materials, special fasteners for attaching reglet to concrete forms, and guides to ensure alignment of reglet section ends.
4. Masonry Type: Provide with offset top flange for embedment in masonry mortar joint.
5. Flexible Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where Drawings show reglet without metal counterflashing.
6. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing lower edge.

2.7 FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated. Shop fabricate items where practicable. Obtain field measurements for accurate fit before shop fabrication.
- B. Fabricate metal flashing and trim using materials matching adjacent panels where exposed.
 1. Concealed Flashing, SHT MTL SKIRT: Where concealed from view, provide stainless steel.
 2. Counter Flashings: Match coping material and finish.
 3. Where exposed to view, match adjacent metal panel material and finish.
 4. Sills, at Grade: Aluminum, finish matching window system.
 5. Jambs and Head Flashings at Framed Openings: Aluminum, finish matching window system.
 6. Openings, Fiberglass: Coated steel, or aluminum. Material and finish to match adjacent metal wall panels.
- C. 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.
- D. Fabricate sheet metal flashing and trim without excessive oil canning, buckling, and tool marks, and true to line and levels indicated, with exposed edges folded back to form hems.
 1. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
 2. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
- E. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA recommendations.
- F. Expansion Provisions: Where lapped or bayonet-type expansion provisions in the Work cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with butyl sealant concealed within joints.
- G. Conceal fasteners and expansion provisions where possible on exposed-to-view sheet metal flashing and trim, unless otherwise indicated.
- H. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
 1. Thickness: As recommended by SMACNA's "Architectural Sheet Metal Manual" for application but not less than thickness of metal being secured.

2.8 ROOF DRAINAGE SHEET METAL FABRICATIONS

- A. Conductor Heads: Fabricate conductor heads with flanged back and stiffened top edge and of dimensions and shape indicated complete with outlet tubes, exterior flange trim, and built-in overflows.
 - 1. Fabricate conductor heads from the following material:
 - a. Aluminum: 0.032 inch (0.81 mm) thick; prefinished.
- B. Hanging Gutters, SHT MTL GUTTER:
 - 1. Fabricate for pre-finished aluminum.
 - 2. Fabricate to cross section required, complete with end pieces, outlet tubes, and other accessories as required.
 - 3. Fabricate in minimum 96-inch- (2400-mm-) long sections.
 - 4. Furnish flat-stock gutter brackets and flat-stock gutter spacers and straps fabricated from same metal as gutters, of size recommended by cited sheet metal standard, but with thickness not less than twice the gutter thickness.
 - 5. Fabricate expansion joints, expansion-joint covers, and gutter accessories from same metal as gutters. Shop fabricate interior and exterior corners.
 - 6. Gutter Profile: As indicated in Drawings.
 - 7. Expansion Joints: Lap type.
 - 8. Accessories: Continuous, removable leaf screen with sheet metal frame and hardware cloth screen.
- C. Built-in Gutters:
 - 1. Fabricate to cross section required, with riveted and soldered joints, complete with end pieces, outlet tubes, and other special accessories as required.
 - 2. Fabricate in minimum 96-inch- (2400-mm-) long sections. Fabricate expansion joints and accessories from same metal as gutters unless otherwise indicated.
 - 3. Fabricate gutters with built-in expansion joints and gutter-end expansion joints at walls.
 - 4. Material: Fabricate built-in gutters from stainless steel; 0.016 inch (0.40 mm) thick.
 - 5. Accessories: Bronze wire-ball downspout strainer.

2.9 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

- A. Parapet Flashing and Fascia Caps: Fabricate in minimum 96 inches (2400-mm-) long, but not exceeding 12-foot- (3-m-) long, sections. Furnish with 6-inch- (150-mm-) wide joint cover plates.
 - 1. Joint Style: Lap, 4 inches (100 mm) wide.
 - 2. Material: Prefinished galvanized steel; 0.022 inch (0.56 mm) thick.
- B. Base Flashing: Fabricate from the following material:
 - 1. Material: Prefinished galvanized steel; 0.022 inch (0.56 mm) thick.
- C. Counterflashing: Fabricate from the following material:
 - 1. Material: Prefinished galvanized steel; 0.022 inch (0.56 mm) thick.
- D. Flashing Receivers: Fabricate from the following material:
 - 1. Material: Prefinished galvanized steel; 0.022 inch (0.56 mm) thick.
- E. Roof-Penetration Flashing: Fabricate from the following material:

1. Material: Prefinished galvanized steel; 0.022 inch (0.56 mm) thick.
- F. Roof-Drain Flashing: Fabricate from the following material:
 1. Material: Prefinished galvanized steel; 0.022 inch (0.56 mm) thick.
- G. Splash Pans: Fabricate from the following material:
 1. Material: Prefinished galvanized steel; 0.022 inch (0.56 mm) thick.
- H. Copings: Fabricate in minimum 96-inch- (2400-mm-) long, but not exceeding 12-foot- (3.6-m-) 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. Shop fabricate interior and exterior corners. Miter corners, solder or weld watertight.
 1. Coping Profile: As indicated.
 2. Joint Style: One of the following:
 - a. Butted with expansion space and 6-inch- (150-mm-) wide, concealed backup plate.
 - b. Standing seam with folded over hem.
 3. Fabricate from the Following Materials:
 4. Material: Prefinished galvanized steel; 0.022 inch (0.56 mm) thick.

2.10 WALL SHEET METAL FABRICATIONS

- A. Openings Flashing in Frame Construction: Fabricate head, sill, jamb, and similar flashings and trim profiles as indicated in Drawings. Form head and sill flashing with end dams as indicated in Drawings. Fabricate from the following material:
 1. Aluminum: 0.032 inch (0.81 mm) thick, prefinished for trim profiles exposed to view.
 2. Galvanized Steel: 20 gauge thick, prefinished for trim profiles exposed to view.

2.11 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Steel Panels and Accessories:
 1. General: AAMA 621. Two-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in both 0.2 mil (5 micron) primer and 0.8 mil (20 micron) color topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - a. Approved PVDF Resin Products:
 - 1) Hylar 5000 by Solvay; www.solvay.com.
 - 2) Kynar 500 by Arkema; www.kynar500.com.
 - b. Basis-of-Design Fluoropolymer Coating Products: Fluropon Classic Coil Coating by Valspar Corp., div. of The Sherwin-Williams Co.; www.valsparcoilextrusion.com.
 - c. Other Approved Fluoropolymer Coating Products: Duranar XL Coil Coating by PPG IdeaScapes; www.ppgideascales.com.
 2. Exposed Finish: Two-coat fluoropolymer (PVDF) finish.
 - a. Colors: Match the color of the adjacent finish, as approved by Architect.
 3. 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 (0.013 mm).

- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of work.
 - 1. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
 - 2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
 - 1. Torch cutting of sheet metal flashing and trim is not permitted.
- B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by fabricator or manufacturers of dissimilar metals.
 - 1. Coat side of uncoated aluminum and stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim will contact wood, ferrous metal, or cementitious construction.
 - 2. Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet or install a course of polyethylene underlayment.
 - 3. Bed flanges in thick coat of asphalt roofing cement where required for waterproof performance.
- C. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.
- D. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and elastomeric or butyl sealant.
- E. 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.
 - 1. Space cleats not more than 12 inches (300 mm) apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.
- F. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (600 mm) of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with elastomeric or butyl sealant concealed within joints.
- G. Fasteners: Use fasteners of sizes that will penetrate substrate not less than 1-1/4 (32 mm) for nails and not less than 3/4-inch (19 mm) for wood screws.
 - 1. Galvanized or Prepainted, Metallic-Coated Steel: Use stainless-steel fasteners.

2. Aluminum: Use aluminum or stainless-steel fasteners.
 3. Copper Use copper or stainless-steel fasteners.
 4. Stainless Steel: Use stainless-steel fasteners.
- H. Seal joints with elastomeric or butyl sealant as required for watertight construction.
1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch (25 mm) into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 deg F (4 and 21 deg C), set joint members for 50 percent movement either way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F (4 deg C).
 2. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."
- I. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pretin edges of sheets to be soldered to a width of 1-1/2 inches (38 mm) except where pretinned surface would show in finished Work.
1. Do not solder pre-painted, metallic-coated steel and aluminum sheet.
 2. Stainless-Steel Soldering: Pretin edges of uncoated sheets to be soldered using solder recommended for stainless steel and phosphoric acid flux. Promptly wash off acid flux residue from metal after soldering.
 3. Copper Soldering: Tin uncoated copper surfaces at edges of sheets using solder recommended for copper work.
 4. Do not use open-flame torches for soldering. Heat surfaces to receive solder and flow solder into joints. Fill joints completely. Completely remove flux and spatter from exposed surfaces.
- J. Aluminum Flashing: Rivet or weld joints in uncoated aluminum where necessary for strength.

3.3 ROOF DRAINAGE SYSTEM INSTALLATION

- A. General: Install sheet metal roof drainage items to produce complete roof drainage system according to SMACNA recommendations and as indicated. Coordinate installation of roof perimeter flashing with installation of roof drainage system.
- B. Splash Pans: Install where downspouts discharge on low-sloped roofs. Set in asphalt roofing cement or elastomeric sealant compatible with roofing membrane.

3.4 ROOF FLASHING INSTALLATION

- A. General: Install sheet metal roof flashing and trim to comply with performance requirements and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight.
- B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations for specified wind zone and as indicated.
- C. Copings: Anchor to resist uplift and outward forces for specified wind zone and as indicated.
- D. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric or butyl sealant, extending a minimum of 4 inches (100 mm) over base flashing. Install stainless-steel draw band and tighten.
- E. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend

counterflashing 4 inches (100 mm) over base flashing. Lap counterflashing joints a minimum of 4 inches (100 mm) and bed with elastomeric or butyl sealant.

1. Secure in a waterproof manner.

- F. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Install flashing as follows:

1. Turn lead flashing down inside vent piping, being careful not to block vent piping with flashing.
2. Seal with elastomeric or butyl sealant and clamp flashing to pipes penetrating roof except for lead flashing on vent piping.

3.5 WALL FLASHING INSTALLATION

- A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to SMACNA recommendations and as indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.
- B. Openings Flashing in Frame Construction: Install continuous head, sill, jamb, and similar flashings to extend 4 inches (100 mm) beyond wall openings.

3.6 MISCELLANEOUS FLASHING INSTALLATION

- A. Overhead-Piping Safety Pans: Suspend pans from pipe and install drain line to plumbing waste or drain line.
- B. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric or butyl sealant to equipment support member.

3.7 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder and sealants.
- C. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain in a clean condition during construction.
- D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 07 71 00 - ROOF SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Copings.
 - 2. Roof-edge specialties.
 - 3. Roof-edge drainage systems.
 - 4. Specialty reglets and counterflashings.
- B. Related Requirements:
 - 1. Section 06 10 00 "Rough Carpentry" for wood nailers, curbs, and blocking.
 - 2. Section 07 62 00 "Sheet Metal Flashing and Trim" for custom- and site-fabricated sheet metal flashing and trim.
 - 3. Section 07 72 00 "Roof Accessories" for set-on-type curbs, equipment supports, roof hatches, vents, and other manufactured roof accessory units.
 - 4. Section 07 92 00 "Joint Sealants" for field-applied sealants between roof specialties and adjacent materials.

1.3 SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For roof specialties.
 - 1. Include plans, elevations, expansion-joint locations, keyed details, and attachments to other work. Distinguish between plant- and field-assembled work.
 - 2. Include details for expansion and contraction; locations of expansion joints, including direction of expansion and contraction.
 - 3. Indicate profile and pattern of seams and layout of fasteners, cleats, clips, and other attachments.
 - 4. Detail termination points and assemblies, including fixed points.
 - 5. Include details of special conditions.
- C. Samples for Initial Selection: For each type of roof specialty indicated with factory-applied color finishes.
- D. Samples for Verification:
 - 1. Include Samples of each type of roof specialty to verify finish and color selection, in manufacturer's standard sizes.

2. Include copings, roof-edge specialties, roof-edge drainage systems, and specialty reglets and counterflashings made from 12-inch (300-mm) lengths of full-size components in specified material, and including fasteners, cover joints, accessories, and attachments.

- E. Qualification Data: For manufacturer.
- F. Product Certificates: For each type of roof specialty.
- G. Product Test Reports: For copings and roof-edge flashings, for tests performed by a qualified testing agency.
- H. Sample Warranty: For manufacturer's special warranty.
- I. Maintenance Data: For roofing specialties to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer offering products meeting requirements that are FM Approvals listed for specified class.
- B. Source Limitations: Obtain roof specialties approved by manufacturer providing roofing-system.
- C. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and set quality standards for fabrication and installation.
 1. Build mockup of typical roof edge as shown 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.
 3. 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 store roof specialties in contact with other materials that might cause staining, denting, or other surface damage. Store roof specialties away from uncured concrete and masonry.
- B. Protect strippable protective covering on roof specialties from exposure to sunlight and high humidity, except to extent necessary for the period of roof-specialty installation.

1.6 FIELD CONDITIONS

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

1.7 WARRANTY

- A. Roofing-System Warranty: Roof specialties are included in warranty provisions in Section 07 54 23 "Thermoplastic Polyolefin (TPO) Roofing".
- B. Special Warranty on Painted Finishes: Manufacturer agrees to repair finish or replace roof specialties 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 Delta E units when tested according to ASTM D2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.

- c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
- 2. Finish Warranty Period: Twenty (20) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Roof specialties shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.
- B. FM Approvals' Listing: Listed in FM Approvals' "RoofNav" and approved for windstorm classification, Class 1-120. Identify materials with FM Approvals' markings.
- C. SPRI Wind Design Standard: Manufacture and install copings and roof-edge specialties tested according to SPRI ES-1 and capable of resisting the following design pressures:
 - 1. Design Pressure: As indicated on Drawings.
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of thermal movements. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 COPINGS

- A. Metal Copings: Manufactured coping system consisting of metal coping cap, concealed anchorage; corner units, end cap units, and concealed splice plates with finish matching coping caps.

2.3 ROOF-EDGE SPECIALTIES

- A. Canted Roof-Edge: Manufactured, two-piece, roof-edge fascia.
- B. Roof-Edge Fascia: Manufactured, two-piece, roof-edge fascia.

2.4 ROOF-EDGE DRAINAGE SYSTEMS

- A. Gutters: Manufactured in uniform section lengths with matching corner units, ends, outlet tubes, and other accessories.
- B. Downspouts: Plain rectangular complete with elbows.
- C. Parapet Scuppers: Manufactured with closure flange trim to exterior, flanges to interior, and base extending beyond cant or tapered strip into field of roof.
- D. Conductor Heads: Manufactured conductor heads, each with flanged back and stiffened top edge, and of dimensions and shape indicated.
- E. Splash Pans: Fabricate from the following exposed metal:

2.5 SPECIALTY REGLETS AND COUNTERFLASHINGS

- A. Reglets: Manufactured units formed to provide secure interlocking of separate reglet and counterflashing pieces.
 - 1. Basis-of-Design Manufacturer: Metal Era; www.metalera.com.
- B. Counterflashings: Manufactured units of heights to overlap top edges of base flashings.

2.6 MATERIALS

- A. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653, G90 coating designation.
- B. Aluminum Sheet: ASTM B 209, alloy as standard with manufacturer for finish required, with temper to suit forming operations and performance required.
- C. Aluminum Extrusions: ASTM B 221, alloy and temper recommended by manufacturer for type of use and finish indicated, finished as follows:
- D. Stainless-Steel Sheet: ASTM A 240 or ASTM A 666, Type 304.

2.7 UNDERLAYMENT MATERIALS

- A. Self-Adhering, High-Temperature Sheet: Slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive.
- B. Felt: ASTM D 226, Type II (No. 30).
- C. Slip Sheet: Rosin-sized building paper.

2.8 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Coil-Coated Galvanized-Steel Sheet Finishes:
 - 1. High-Performance Organic Finish: Prepare, pretreat, and apply coating to exposed metal surfaces PER ASTM A 755 and coating and resin manufacturers' written instructions.
 - a. Three-Coat Metallic Fluoropolymer: AAMA 621. Fluoropolymer finish with suspended metallic flakes containing not less than 70 percent PVDF resin.
- C. Coil-Coated Aluminum Sheet Finishes:
 - 1. High-Performance Organic Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - a. Three-Coat Metallic Fluoropolymer: AAMA 2605. Fluoropolymer finish with suspended metallic flakes containing not less than 70 percent PVDF resin.
 - 2. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.
- D. Aluminum Extrusion Finishes:
 - 1. High-Performance Organic Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - a. Three-Coat Metallic Fluoropolymer: AAMA 2605. Fluoropolymer finish with suspended metallic flakes containing not less than 70 percent PVDF resin.
 - 2. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.
- B. Examine walls, roof edges, and parapets for suitable conditions for roof specialties.
- C. Verify that substrate is sound, dry, smooth, clean, sloped for drainage where applicable, and securely anchored.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF UNDERLAYMENT

- A. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches (152 mm) staggered 24 inches (610 mm) between courses. Overlap side edges not less than 3-1/2 inches (90 mm). Roll laps with roller. Cover underlayment within 14 days.
 - 1. Coordinate application of self-adhering sheet underlayment under roof specialties with requirements for continuity with adjacent air barrier materials.
- B. Felt Underlayment: Install with adhesive for temporary anchorage to minimize use of mechanical fasteners under roof specialties. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches (50 mm).
- C. Slip Sheet: Install with tape or adhesive for temporary anchorage to minimize use of mechanical fasteners under roof specialties. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches (50 mm).

3.3 INSTALLATION, GENERAL

- A. Install roof specialties according to manufacturer's written instructions. Anchor roof specialties securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, underlayments, sealants, and other miscellaneous items as required to complete roof-specialty systems.
 - 1. Install roof specialties level, plumb, true to line and elevation; with limited oil-canning and without warping, jogs in alignment, buckling, or tool marks.
 - 2. Provide uniform, neat seams with minimum exposure of solder and sealant.
 - 3. Install roof specialties to fit substrates and to result in weathertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture.
 - 4. Torch cutting of roof specialties is not permitted.
 - 5. Do not use graphite pencils to mark metal surfaces.
- 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. Coat concealed side of uncoated aluminum and stainless steel roof specialties with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
 - 2. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof specialties for waterproof performance.
- C. Expansion Provisions: Allow for thermal expansion of exposed roof specialties.
 - 1. Space movement joints at a maximum of 12 feet (3.6 m) with no joints within 18 inches (450 mm) of corners or intersections unless otherwise indicated on Drawings.
 - 2. When ambient temperature at time of installation is between 40 and 70 deg F (4 and 21 deg C), set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures.
- D. Fastener Sizes: Use fasteners of sizes that penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.
- E. Seal concealed joints with butyl sealant as required by roofing-specialty manufacturer.
- F. Seal joints as required for weathertight construction. Place sealant to be completely concealed in joint. Do not install sealants at temperatures below 40 deg F (4 deg C).

- G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets to be soldered to a width of 1-1/2 inches (38 mm); however, reduce pre-tinning where pre-tinned surface would show in completed Work. Tin edges of uncoated copper sheets using solder for copper. Do not use torches for soldering. Heat surfaces to receive solder and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.

3.4 INSTALLATION OF COPINGS

- A. Install cleats, anchor plates, and other anchoring and attachment accessories and devices with concealed fasteners.
- B. Anchor copings with manufacturer's required devices, fasteners, and fastener spacing to meet performance requirements.

3.5 INSTALLATION OF ROOF-EDGE SPECIALTIES

- A. Anchor roof edgings with manufacturer's required devices, fasteners, and fastener spacing to meet performance requirements.

3.6 INSTALLATION OF ROOF-EDGE DRAINAGE-SYSTEM

- A. Install components to produce a complete roof-edge drainage system according to manufacturer's written instructions. Coordinate installation of roof perimeter flashing with installation of roof-edge drainage system.
- B. Gutters: Join and seal gutter lengths. Allow for thermal expansion. Attach gutters to firmly anchored gutter supports spaced not more than 30 inches (762 mm) apart. Attach ends with rivets and [seal with sealant] [solder] to make watertight. Slope to downspouts.
 - 1. Install gutter with expansion joints at locations indicated but not exceeding 50 feet (15.2 m) apart. Install expansion-joint caps.
 - 2. Install continuous leaf guards on gutters with noncorrosive fasteners, removable or hinged to swing open for cleaning gutters.
- C. Downspouts: Join sections with manufacturer's standard telescoping joints. Provide hangers with fasteners designed to hold downspouts securely to walls and 1 inch (25 mm) away from walls; locate fasteners at top and bottom and at approximately 60 inches (1500 mm) o.c.
 - 1. Provide elbows at base of downspouts at grade to direct water away from building.
 - 2. Connect downspouts to underground drainage system indicated.
- D. Splash Pans: Install where downspouts discharge on low-slope roofs. Set in asphalt roofing cement or elastomeric sealant.
- E. Parapet Scuppers: Install scuppers through parapet where indicated. Continuously support scupper, set to correct elevation, and seal flanges to interior wall face, over cants or tapered edge strips, and under roofing membrane.
 - 1. Anchor scupper closure trim flange to exterior wall and seal or solder to scupper.
 - 2. Loosely lock front edge of scupper with conductor head.
 - 3. Seal or solder exterior wall scupper flanges into back of conductor head.
- F. Conductor Heads: Anchor securely to wall with elevation of conductor top edge 1 inch (25 mm) below scupper or gutter discharge.

3.7 INSTALLATION OF REGLETS AND COUNTERFLASHINGS

- A. Coordinate installation of reglets and counterflashings with installation of base flashings.

- B. Surface-Mounted Reglets: Install reglets to receive flashings where flashing without embedded reglets is indicated on Drawings. Install at height so that inserted counterflashings overlap 4 inches (100 mm) over top edge of base flashings.
- C. Counterflashings: Insert counterflashings into reglets or other indicated receivers; ensure that counterflashings overlap 4 inches (100 mm) over top edge of base flashings. Lap counterflashing joints a minimum of 4 inches (100 mm) and bed with butyl sealant. Fit counterflashings tightly to base flashings.

3.8 CLEANING AND PROTECTION

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

END OF SECTION

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SECTION 07 81 23 - INTUMESCENT FIREPROOFING

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. Spray-applied, intumescent fire-resistive coating.
 - 2. Delegated design.
- B. Related Requirements:
 - 1. Section 01 61 16 "Delegated Design Requirements".
 - 2. Section 05 12 00 "Structural Steel Framing" for shop applied primer.
 - 3. Section 09 91 00 "Painting" for coordination of color topcoat.

1.3 REFERENCES

- A. Association of the Wall and Ceiling Industry (AWCI):
 - 1. Technical Manual 12-B, Standard Practice for the Testing and Inspection of Field Applied Thin-Film Intumescent Fire-Resistive Materials.

1.4 SUBMITTALS

- A. Product Data:
 - 1. Manufacturer's written product information for each type of product.
 - 2. Qualification Data: For installer and testing agency.
 - 3. Product Certificates: For each type of fireproofing, stating product meets or exceeds specifications.
 - 4. Evaluation Reports: For fireproofing, from ICC-ES.
 - 5. Primer Compatibility: Submit certification that shop-applied or field-applied primers are compatible with the sprayed-applied intumescent fireproofing and will not impair the fireproofing's performance under fire exposure for applications indicated, as tested by ASTM E119.
- B. Delegated-Design Submittal: For intumescent fireproofing, to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Shop Drawings: Framing plans or schedules, or both, indicating the following:
 - 1. Extent of fireproofing for each construction and fire-resistance rating.
 - 2. Applicable fire-resistance design designations of a qualified testing and inspecting agency acceptable to authorities having jurisdiction.
 - 3. Minimum fireproofing thicknesses needed to achieve required fire-resistance rating of each structural component and assembly.
 - 4. Treatment of fireproofing after application.

- D. Samples: For each exposed product and for each color and texture specified, in manufacturer's standard dimensions in size.
- E. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A firm or individual certified, licensed, or otherwise qualified by fireproofing manufacturer as experienced and with sufficient trained staff to install manufacturer's products according to specified requirements.
- B. Mockup: Build mockup to verify selections made under Sample submittals and to demonstrate aesthetic effects and to set quality standards for materials and execution.
 - 1. Build mockup of each type of fireproofing and different substrate and each required finish as shown on Drawings. For sanded, smooth finish sand after each fireproofing application to show anticipated final finish as specified.
 - 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.
- C. Preinstallation Conference: Conduct conference at Project site.

1.6 DELIVERY, HANDLING AND STORAGE

- A. Store materials indoors in a dry environment between 33 deg F to 100 deg F.
- B. Shelf Life: 6 months, when stored at recommended conditions.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not apply fireproofing when ambient or substrate temperature is 50 deg F or lower unless temporary protection and heat are provided to maintain temperature at or above this level for 24 hours before, during, and for 24 hours after product application.
- B. Ventilation: Ventilate building spaces during and after application of fireproofing, providing complete air exchanges according to manufacturer's written instructions. Use natural means or, if they are inadequate, forced-air circulation until fireproofing dries thoroughly.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Assemblies: Provide fireproofing, including auxiliary materials, according to requirements of each fire-resistance design and manufacturer's written instructions.
- B. Source Limitations: Obtain fireproofing for each fire-resistance design from single source.
- C. Fire-Resistance Design: Indicated on Drawings, tested according to ASTM E119 or UL 263; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Fire-Resistant Rating: 1 Hour.
 - 2. Steel members are to be considered unrestrained unless specifically noted otherwise.
- D. Physical Characteristics:
 - 1. Hardness: ASTM D2240; Shore D 65-70 fully cured; Shore D 60 with topcoat.
 - 2. Impact: ASTM D2794; 152 inch-pound.

3. Abrasion: ASTM D4060; 103 mg loss at 1000 cycles.
 4. Bond Strength: ASTM D4541; 125 psi minimum.
 5. Compressive Strength: ASTM E761; 757 psi.
 6. Surface Burning: ASTM E84; Class A, Flame spread 25 or less, smoke developed 450 or less.
 7. Dry Applied Density: 89 pounds per cubic foot.
- E. Asbestos: Provide products containing no detectable asbestos.

2.2 MANUFACTURERS

- A. Approved Manufacturers:
1. A/D Firefilm, Div. of Carboline Co.; www.carboline.com.
 2. Albi Manufacturing, Div. of StanChem, Inc.; www.albi.com.
 3. Hilti; www.hilti.com.
 4. Isolatek Intl.; www.isolatek.com.

2.3 INTUMESCENT FIRE-RESISTIVE COATINGS

- A. Material: Manufacturer's standard, factory-mixed formulation or factory-mixed, multicomponent system consisting of steel primer, intumescent base coat and colored topcoat, and complying with indicated fire-resistance design.
1. Basis-of-Design Product: As selected by Architect.
 2. UL-Design Number: As determined by the manufacturer and/ or installer for the conditions indicated. Refer to delegated design requirements.
 3. Application: Designated for "general purpose" use by a qualified testing agency acceptable to authorities having jurisdiction.
 4. Base Coat(s) Total Thickness: As required to achieve fire-resistance design indicated, measured according to requirements of fire-resistance design.
 5. Finish Topcoat:
 - a. Surface Finish: As selected.
 - b. Color and Gloss: As selected by Architect.

2.4 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that are compatible with fireproofing and substrates and are approved by UL or another testing and inspecting agency acceptable to authorities having jurisdiction for use in fire-resistance designs indicated.
- B. Substrate Primers: Primers approved by fireproofing manufacturer and complying with required fire-resistance design by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
- C. Topcoat: Suitable for application over applied fireproofing; of type recommended in writing by fireproofing manufacturer for each fire-resistance design. Custom color shall be as selected by the Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrates and other conditions affecting performance of the Work and according to each fire-resistance design.
 - 1. Verify that substrates are clean, dry, and free of dirt, dust, oil, grease, release agents, rolling compounds, loose mill scale, loose scale, incompatible primers, paints, and encapsulants, or other foreign substances capable of impairing bond of fireproofing with substrates under conditions of normal use or fire exposure.
 - 2. Verify that objects penetrating fireproofing, including clips, hangers, support sleeves, and similar items, are securely attached to substrates.
 - 3. Verify that substrates receiving fireproofing are not obstructed by ducts, piping, equipment, or other suspended construction that will interfere with fireproofing application.
- B. Conduct tests according to fireproofing manufacturer's written instructions to verify that substrates are free of substances capable of interfering with bond.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Protection: Mask or cover other work subject to exposure or damage from fallout or overspray of fireproofing materials during application.
- B. Clean substrates of substances that could impair bond of fireproofing.
- C. Ventilation: Close off and seal ductwork in areas where fireproofing is being applied.
- D. Surface Preparation for Unprimed Steel Members:
 - 1. Shop: Commercial Blast Cleaning, SSPC-SP-6 with average peak-to-valley profile of 0.0015-inch (1.5-mils).
 - 2. Field Preparation or Field Touch-Up: Solvent Wipe, SSPC-SP-1; then, either Hand Tool Cleaning, SSPC-SP-2 or Power Tool Cleaning, SSPC-SP-3.
- E. Prime substrates where included in fire-resistance design and where recommended in writing by fireproofing manufacturer unless compatible shop primer has been applied and is in satisfactory condition to receive fireproofing.
- F. Damaged Primer: Repair areas of damaged primer in accordance with fireproofing manufacturer's recommendations before applying fireproofing material.
- G. For applications visible on completion of Project, repair substrates to remove surface imperfections that could affect uniformity of texture and thickness in finished surface of fireproofing. Remove minor projections and fill voids that would telegraph through fire-resistive products after application.

3.3 APPLICATION

- A. Construct fireproofing assemblies that are identical to fire-resistance design indicated and products as specified, tested, and substantiated by test reports; for thickness, primers, topcoats, finishing, and other materials and procedures affecting fireproofing work.

- B. Comply with fireproofing manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to mix, convey, and apply fireproofing; as applicable to particular conditions of installation and as required to achieve fire-resistance ratings indicated.
- C. Coordinate application of fireproofing with other construction to minimize need to cut or remove fireproofing.
 - 1. Do not begin applying fireproofing until clips, hangers, supports, sleeves, and other items penetrating fireproofing are in place.
 - 2. Defer installing ducts, piping, and other items that would interfere with applying fireproofing until application of fireproofing is completed.
- D. Install auxiliary materials as required, as detailed, and according to fire-resistance design and fireproofing manufacturer's written instructions for conditions of exposure and intended use. For auxiliary materials, use attachment and anchorage devices of type recommended in writing by fireproofing manufacturer.
- E. Spray apply fireproofing to maximum extent possible. After the spraying operation in each area, complete the coverage by trowel application or other placement method recommended in writing by fireproofing manufacturer.
- F. Application Thickness: Spray-apply intumescent fireproofing in number of coats and total thickness as required to meet fire rating and UL Design required on Drawings.
- G. Extend fireproofing in full thickness over entire area of each substrate to be protected.
- H. Provide a uniform finish complying with description indicated for fireproofing material and matching finish approved for required mockups.
- I. Cure fireproofing according to fireproofing manufacturer's written instructions.
- J. Do not install enclosing or concealing construction until after fireproofing has been applied, inspected, and tested and corrections have been made to deficient applications.
- K. Finishes: Where indicated, apply fireproofing to produce the following finish:
 - 1. Sanded, smooth finish: After each spray coat application, lightly sand surface before application of next coat. Lightly sand final base coat and test to confirm required coating thickness before applying decorative top coat.

3.4 FIELD QUALITY CONTROL

- A. Inspecting Agency: Owner will engage a qualified testing agency to perform tests and inspections:
 - 1. Test and inspect as required by the OSSC, Subsection 1705.14, "Mastic and Intumescent Fire-Resistant Coatings," to comply with AWCI 12-B,
- B. Perform the tests and inspections of completed Work in successive stages. Do not proceed with application of fireproofing for the next area until test results for previously completed applications of fireproofing show compliance with requirements. Tested values must equal or exceed values as specified and as indicated and required for approved fire-resistance design.
- C. Fireproofing will be considered defective if it does not pass tests and inspections.
 - 1. Remove and replace fireproofing that does not pass tests and inspections, and retest.
 - 2. Apply additional fireproofing, per manufacturer's written instructions, where test results indicate insufficient thickness, and retest.
- D. Prepare test and inspection reports.

3.5 CLEANING, PROTECTING, AND REPAIRING

- A. Cleaning: Immediately after completing spraying operations in each containable area of Project, remove material overspray and fallout from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.
- B. Protect fireproofing, according to advice of manufacturer and Installer, from damage resulting from construction operations or other causes, so fireproofing is without damage or deterioration at time of Substantial Completion.
- C. As installation of other construction proceeds, inspect fireproofing and repair damaged areas and fireproofing removed due to work of other trades.
- D. Repair fireproofing damaged by other work before concealing it with other construction.
- E. Repair fireproofing by reapplying it using same method as original installation or using manufacturer's recommended trowel-applied product.

END OF SECTION

SECTION 07 84 13 - PENETRATION FIRESTOPPING

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. Penetrations in fire-resistance-rated walls.
 - 2. Penetrations in horizontal assemblies.
 - 3. Penetrations in smoke barriers.
- B. Related Requirements:
 - 1. Section 07 92 00 "Joint Sealants" for non-fire-resistant joint sealants.

1.3 SUBMITTALS

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

1.4 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."
 - 2) FM Global in its "Building Materials Approval Guide."
 - 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 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 E814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
 - 1. Fire-resistance-rated walls include fire walls.
 - 2. F-Rating: Not less than the fire-resistance rating of constructions penetrated.
- C. Penetrations in Horizontal Assemblies: Provide penetration firestopping with ratings determined per ASTM E814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
 - 1. Horizontal assemblies include floors.
 - 2. F-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated.
 - 3. T-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
- D. 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.

- E. W-Rating: Provide penetration firestopping showing no evidence of water leakage when tested according to UL 1479.
- F. 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.
- G. 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.
- H. Low-Emitting Materials: Penetration firestopping sealants and sealant primers shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- I. 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.

2.2 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. 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.

2.3 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.

END OF SECTION

SECTION 07 92 00 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Silicone joint sealants.
 - 2. Nonstaining silicone joint sealants.
 - 3. Urethane joint sealants.
 - 4. Immersible joint sealants.
 - 5. Mildew-resistant joint sealants.
 - 6. Latex joint sealants.
- B. Related Requirements:
 - 1. Section 07 84 13 "Penetration Firestopping" for fire-resistant joint sealants.
 - 2. Section 09 29 00 "Gypsum Board" for acoustical sealant.

1.3 PREINSTALLATION MEETINGS

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

1.4 SUBMITTALS

- A. Product Data: For each joint-sealant product.
- B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- C. Samples for Verification: For each 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.
- D. Joint-Sealant Schedule: Include the following information:
 - 1. Joint-sealant application, joint location, and designation.
 - 2. Joint-sealant manufacturer and product name.
 - 3. Joint-sealant formulation.
 - 4. Joint-sealant color.
- E. Qualification Data: For qualified testing agency.
- F. Product Test Reports: For each kind of joint sealant, for tests performed by a qualified testing agency.
- G. Preconstruction Laboratory Test Schedule: Include the following information for each joint sealant and substrate material to be tested:
 - 1. Joint-sealant location and designation.

2. Manufacturer and product name.
 3. Type of substrate material.
 4. Proposed test.
 5. Number of samples required.
 - H. Preconstruction Laboratory 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 are needed for adhesion.
 - I. 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.
 - J. Field-Adhesion-Test Reports: For each sealant application tested.
 - K. Sample Warranties: For special warranties.
- 1.5 QUALITY ASSURANCE
- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.
 - B. Product Testing: Test joint sealants using a qualified testing agency.
 1. Testing Agency Qualifications: Qualified according to ASTM C1021 to conduct the testing indicated.
 - C. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.
- 1.6 PRECONSTRUCTION TESTING
- A. Preconstruction Laboratory Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
 1. Adhesion Testing: Use ASTM C794 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
 2. Compatibility Testing: Use ASTM C1087 to determine sealant compatibility when in contact with glazing and gasket materials.
 3. Stain Testing: Use ASTM C1248 to determine stain potential of sealant when in contact with porous substrates.
 4. Submit manufacturer's recommended number of pieces of each type of material, including joint substrates, joint-sealant backings, and miscellaneous materials.
 5. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
 6. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures, including use of specially formulated primers.
 7. Testing will not be required if joint-sealant manufacturers submit data that are based on previous testing, not older than 24 months, of sealant products for adhesion to, staining of, 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 kind of sealant and joint substrate.
 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 X1.1 in ASTM C1193 or Method A, Tail Procedure, in ASTM C1521.
 - 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.

1.7 FIELD 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.
 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.

1.8 WARRANTY

- A. Special Installer's Warranty: 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 agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
1. Warranty Period: Five years from date of Substantial Completion.
- C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
 2. Disintegration of joint substrates from 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. All openings, gaps, and joints in floor and wall assemblies in contact with soil and at gaps around pipes, toilets, bathtubs, or drains penetrating these assemblies shall be filled or closed with materials that provide a permanent air-tight seal.
- B. Only smaller gaps shall be sealed with elastomeric joint sealant, as defined by ASTM C 920; maximum joint width as recommended by sealant manufacturer.
 1. Large openings shall not be sealed with elastomeric joint sealant, but rather with nonshrink grout or expanding foam materials; refer to Sections 03 30 00 "Cast-in-Place Concrete" for nonshrink grout and to Section 07 21 00 "Building Insulation" for expanding foam.
- C. Physical properties of elastomeric joint sealants shall meet requirements of Radon Mitigation System as indicated in the Drawings

2.2 JOINT SEALANTS, 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. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.3 SILICONE JOINT SEALANTS

- A. Nonstaining Joint Sealants: No staining of substrates when tested according to ASTM C1248.
- B. Silicone, S, NS, 100/50, NT (SEALANT): Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 100/50, Use NT.
 1. Basis-of-Design Product: Dow Corning 790 by Dow Corning Corp.; www.dowcorning.com.
 2. Other Approved Manufacturers:
 - a. GE Construction Sealants; Momentive Performance Materials Inc.; www.siliconeforbuilding.com.
 3. Applications:
 - a. Non-porous dissimilar materials.
 - b. Joints: 3/8 inch wide or less.
- C. Silicone, S, NS, 50, NT: Single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 50, Use NT.
 1. Approved Manufacturers:
 - a. Dow Corning Corporation; www.dowcorning.com.
 - b. GE Construction Sealants; Momentive Performance Materials Inc.; www.siliconeforbuilding.com.
 - c. Sika Corporation; www.sika.com.

2. Applications: Similar materials.
 - D. Silicone, Nonstaining, S, NS, 100/50, NT: Nonstaining, single-component, nonsag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 100/50, Use NT.
 1. Approved Manufacturers:
 - a. Sika Corporation; www.sika.com.
 - b. Tremco Incorporated; www.tremco.com.
 2. Applications: Porous exterior substrates.
 - E. Silicone, Nonstaining, S, NS, 25, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT.
 1. Basis-of-Design Product: 758 Silicone Weather Barrier Sealant by Dow Corning; www.dowcorning.com.
 2. Application: Sealing weather barrier materials and adjacent surfaces where low movement is anticipated.
 - F. Silicone, Nonstaining, S, NS, 50, NT: Nonstaining, single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 50, Use NT.
 1. Approved Manufacturers:
 - a. Dow Corning Corporation; www.dowcorning.com.
 - b. GE Construction Sealants; Momentive Performance Materials Inc.; www.siliconeforbuilding.com.
 - c. Sika Corporation; www.sika.com.
 - d. Tremco Incorporated; www.tremco.com.
 2. Applications: At expansion and control joints, precast concrete panel joints, perimeter caulking, aluminum, masonry and vinyl siding.
- 2.4 URETHANE JOINT SEALANTS
- A. Urethane, S, NS, 100/50, T, NT: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type S, Grade NS, Class 100/50, Uses T and NT, uses NT, M, A, O and I (Class 2).
 1. Approved Manufacturers:
 - a. Sika Corporation; www.sika.com.
 2. Applications: At expansion and control joints, precast concrete panel joints, perimeter caulking, aluminum, masonry and vinyl siding.
 - B. Urethane, M, P, 50, T, NT: Multicomponent, pourable, plus 50 percent and minus 50 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type M, Grade P, Class 50, Uses T and NT.
 1. Approved Manufacturers:
 - a. LymTal International Inc.; www.lymtal.com.
 2. Applications: Exterior paintable surfaces and exterior and interior horizontal concrete joints.

- C. Urethane, M, P, 25, T, NT: Multicomponent, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type M, Grade P, Class 25, Uses T and NT.

- 1. Approved Manufacturers:
 - a. BASF Corporation; www.basf.com.
- 2. Applications: General.

2.5 IMMERSIBLE JOINT SEALANTS

- A. Immersible Joint Sealants. Suitable for immersion in liquids; ASTM C1247, Class 2; tested in deionized water unless otherwise indicated
- B. Urethane, Immersible, S, NS, 100/50, NT, I: Immersible, single-component, nonsag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, urethane joint sealant; ASTM C920, Type S, Grade NS, Class 100/50, Uses NT, and I.

- 1. Approved Manufacturers:
 - a. Tremco Incorporated; www.tremco.com.

2.6 MILDEW-RESISTANT JOINT SEALANTS

- A. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.
- B. Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT.

- 1. Approved Manufacturers:
 - a. Dow Corning Corporation; www.dowcorning.com.
 - b. GE Construction Sealants; Momentive Performance Materials Inc.; www.siliconeforbuilding.com.
 - c. Tremco Incorporated; www.tremco.com.
- 2. Applications: At joints in ceramic tile walls and floor, around equipment and around plumbing fixtures.

2.7 BUTYL JOINT SEALANTS

- A. Butyl-Rubber-Based Joint Sealants: ASTM C1311.

- 1. Approved Manufacturers:
 - a. Pecora Corporation; www.pecora.com.
 - b. Tremco Incorporated; www.tremco.com.
- 2. Applications: At curtainwall joints, metal panel joining, bedding thresholds, secondary glazing seals, and areas where a seal is required against EPDM gaskets.

2.8 LATEX JOINT SEALANTS

- A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C834, Type OP, Grade NF.

- 1. Basis-of-Design Product: Tremco Acrylic Latex Caulk by Tremco.
- 2. Applications: At interior frames/ walls.

2.9 LOW EXPANDING FOAM SEALANTS

- A. Low expanding, one-component, polyurethane foam sealant, curing to a semi-rigid, closed cell urethane foam.
 - 1. Applications:
 - a. Apply between top of precast concrete panels and metal framing.
 - b. Miscellaneous openings and voids in exterior walls.

2.10 JOINT-SEALANT BACKING

- A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C1330, 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. Elastomeric Tubing Sealant Backings: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 25 deg F (minus 32 deg C). Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and to otherwise contribute to optimum sealant performance.
- D. 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.

2.11 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 performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and

approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.

2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
 - a. Concrete.
 - b. Masonry.
 - c. Unglazed surfaces of ceramic tile.
 - d. Exterior insulation and finish systems.
3. Remove laitance and form-release agents from concrete.
4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
 - a. Metal.
 - b. Glass.
 - c. Porcelain enamel.
 - d. Glazed surfaces of ceramic tile.

- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C1193 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 configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.

3.4 PATCHING VOIDS

- A. Installation procedures of elastomeric joint sealants shall meet requirements of Radon Mitigation System as indicated in the Drawings.
- B. At above-grade applications, inject elastomeric joint sealants into all smaller openings, gaps, and joints in floor and wall assemblies in contact with soil and at gaps around all pipes, toilets, bathtubs, or drains penetrating these assemblies so no voids remain and to provide a permanent air-tight seal.
- C. Where appropriate, larger gaps shall be sealed with nonshrink grout or expanding foam; refer to Sections 03 30 00 "Cast-in-Place Concrete" and 07 21 00 "Thermal Insulation".

3.5 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 (300 m) of joint length for each kind of sealant and joint substrate.
 - b. Perform one test for each 1000 feet (300 m) of joint length thereafter or one 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 C1193 or Method A, Tail Procedure, in ASTM C1521.
 - 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 complies with 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 material, 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.
- 3.6 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.
- 3.7 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, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION

SECTION 08 11 13 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Interior hollow metal doors and frames.
 - 2. Exterior hollow metal doors and frames.
- B. Related Requirements:
 - 1. Section 08 71 00 "Door Hardware" for door hardware for hollow-metal doors.
 - 2. Section 08 80 00 "Glazing" for glazing products for door vision panels and sidelites.

1.3 DEFINITIONS

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

1.4 COORDINATION

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

1.5 PREINSTALLATION MEETINGS

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

1.6 SUBMITTALS

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

- C. Schedule: Provide a schedule of hollow-metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final Door Hardware Schedule.
- D. Product Test Reports: For each type of hollow-metal door and frame assembly, for tests performed by a qualified testing agency.
- E. Oversize Construction Certification: For assemblies required to be fire rated and exceeding limitations of labeled assemblies.

1.7 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 PERFORMANCE 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 and temperature-rise limits 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-Lite 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. Sound-Control Doors: Assemblies tested in a laboratory for sound-transmission-loss performance according to ASTM E90, calculated according to ASTM E413, and rated for not less than the STC value indicated.
- D. Exterior Thermally Rated Door Assemblies: Provide door assemblies with U-factor of not more than 0.68 Btu/sq. ft. x h x deg F (3.86 W/sq. m x K) as determined according to NFRC 100.

2.2 MANUFACTURERS

- A. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.
- B. Approved Manufacturers:
 - 1. Ceco Door, div. of Assa Abloy; www.cecodoor.com.
 - 2. Curries Co., div. of Assa Abloy; www.curries.com.
 - 3. Deansteel Manufacturing Co., Inc.; www.dansteel.com.
 - 4. Overly Door Co.; www.door.overly.com.
 - 5. Steelcraft; div. of Allegion; www.allegion.com.
 - 6. Stiles Custom Metal, Inc.; www.stilesdoors.com.

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. Standard-Duty Doors and Frames: SDI A250.8, Level 1. At interior locations indicated in the Door and Frame Schedule.
 - 1. Physical Performance: Level C 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 0.032 inch.
 - d. Edge Construction: Model 1, Full Flush.
 - 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, cold-rolled steel sheet, minimum thickness of 0.042 inch.
 - b. Sidelite and Transom Frames: Fabricated from same thickness material as adjacent door frame.
 - c. Construction: Full profile welded.
 - 4. Finish: Factory-primed; field-painted.

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. Heavy-Duty Doors and Frames: SDI A250.8, Level 2. At exterior locations indicated in the Door and Frame 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: Metallic-coated steel sheet, minimum thickness of 0.042 inch, with minimum G90 coating.
 - 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: Metallic-coated steel sheet, minimum thickness of 0.053 inch, with minimum G90 coating.
 - b. Construction: Full profile welded.

4. Finish: Factory-primed; field-painted.

2.5 BORROWED LITES

- A. Hollow-metal frames of uncoated steel sheet, minimum thickness of 0.053 inch.

1. Construction: Full profile welded.

2.6 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 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 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, 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.

2.7 ACCESSORIES

- A. Louvers: Provide louvers for interior doors, where indicated, which comply with SDI 111C, with blades or baffles formed of 0.020-inch- thick, cold-rolled steel sheet set into 0.032-inch- thick steel frame.

1. Sightproof Louver: Stationary louvers constructed with inverted-V or inverted-Y blades.
2. Fire-Rated Automatic Louvers: Louvers constructed with movable blades closed by actuating fusible link, and listed and labeled for use in fire-rated door assemblies of type and fire-resistance rating indicated by same qualified testing and inspecting agency that established fire-resistance rating of door assembly.

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

- C. Grout Guards: Formed from same material as frames, not less than 0.016 inch thick.

2.8 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

- B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.

- D. 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.

- E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- F. 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.
- G. Grout: ASTM C 476, except with a maximum slump of 4 inches, as measured according to ASTM C 143/C 143M.
- H. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
- I. Glazing: Comply with requirements in Section 08 80 00 "Glazing."
- J. 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.

2.9 FABRICATION

- A. Fabricate hollow-metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Hollow-Metal Doors:
 - 1. Steel-Stiffened Door Cores: Provide minimum thickness 0.026 inch, steel vertical stiffeners of same material as face sheets extending full-door height, with vertical webs spaced not more than 6 inches apart. Spot weld to face sheets no more than 5 inches o.c. Fill spaces between stiffeners with glass- or mineral-fiber insulation.
 - 2. Fire Door Cores: As required to provide fire-protection and temperature-rise ratings indicated.
 - 3. Vertical Edges for Single-Acting Doors: Provide beveled or square edges at manufacturer's discretion.
 - 4. Top Edge Closures: Close top edges of doors with inverted closures, except provide flush closures at exterior doors 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. Sidelite and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by 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 from 90 to 120 inches high.
 - 4) 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 from 90 to 96 inches high.
 - 4) 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. 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.
 7. Terminated Stops: Terminate stops 6 inches above finish floor with a 45-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. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
4. Provide loose stops and moldings on inside of hollow-metal work.
5. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.

2.10 STEEL FINISHES

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

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

- A. General: Install hollow-metal work plumb, rigid, properly aligned, and securely fastened in place. Comply with Drawings and manufacturer's written instructions.
- B. Hollow-Metal Frames: Install hollow-metal frames for doors, transoms, sidelites, borrowed lites, and other openings, of size and profile indicated. Comply with SDI A250.11 or NAAMM-HMMA 840 as required by standards specified.
 1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
 - a. At fire-rated openings, install frames according to NFPA 80.
 - b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
 - c. Install frames with removable stops located on secure side of opening.
 - d. Install door silencers in frames before grouting.

- e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - f. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
 - 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. 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. Concrete Walls: Solidly fill space between frames and concrete with mineral-fiber insulation.
 - 6. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
 - 7. In-Place Metal or Wood-Stud Partitions: Secure slip-on drywall frames in place according to manufacturer's written instructions.
 - 8. 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 80 00 "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.

END OF SECTION

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SECTION 08 14 16 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Solid-core doors, including fire-rated and non-rated.
 - 2. Hollow-core flush wood veneer-faced doors
 - 3. Hardware not specified in other Sections:
 - a. For sliding closet doors.
- B. Related Requirements:
 - 1. Section 06 10 00 "Rough Carpentry" for coordination with framing and for blocking.
 - 2. Section 08 71 00 "Door Hardware" for door hardware installed with flush wood doors.

1.3 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. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.
 - 1. Indicate doors to be factory finished and finish requirements.
 - 2. Indicate fire ratings for fire doors.
- C. Samples for Initial Selection: Color charts consisting of actual materials in small sections for the following:
 - 1. Faces of Factory-Finished Doors: Show the full range of colors available for stained and opaque finishes.
- D. Samples for Verification:
 - 1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches for each material and finish. For each wood species and transparent finish, provide set of three samples showing typical range of color and grain to be expected in the finished work.
 - 2. Corner sections of doors, approximately 8 by 10 inches, with door faces and edgings representing typical range of color and grain for each species of veneer and solid lumber required. Finish sample with same materials proposed for factory-finished doors.
 - 3. Louver blade and frame sections, 6 inches long, for each material and finish specified.
 - 4. Frames for light openings, 6 inches long, for each material, type, and finish required.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain flush wood doors through one source from a single manufacturer.

- B. Quality Standard: Comply with AWI's "Architectural Woodwork Quality Standards Illustrated."
 - 1. Provide AWI Quality Certification Labels or an AWI letter of licensing for Project indicating that doors comply with requirements of grades specified.
- C. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.
 - 1. Test Pressure: After five minutes into the test, the neutral pressure level in furnace shall be established at 6 inches or less above the sill.
 - 2. Oversize, Fire-Rated Wood Doors: For door assemblies exceeding sizes of tested assemblies, provide oversize fire door label or certificate of inspection, from a testing and inspecting agency acceptable to authorities having jurisdiction, stating that doors comply with requirements of design, materials, and construction.
 - 3. Temperature-Rise Rating: At exit enclosures, provide doors that have a temperature-rise rating of 250 deg C maximum in 30 minutes of fire exposure.
- D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Contractor's Quality Control."

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.
- B. Package doors individually in cardboard cartons and wrap bundles of doors in plastic sheeting package and deliver as required.
- C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until building is enclosed, wet work is complete, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature between 16 and 32 deg C and relative humidity between 43 and 70 percent during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Wood Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction, for fire-protection ratings and temperature-rise limits indicated on Drawings, based on testing at positive pressure in accordance with UL 10C or NFPA 252.
 - 1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.
 - 2. Temperature-Rise Limit: If required by AHJ, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F above ambient after 30 minutes of standard fire-test exposure.
- B. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing in accordance with UL 1784 and installed in compliance with NFPA 105.

- C. Recycled Content:
 - 1. Composite Wood: Provide composite wood door cores with minimum 60 percent recycled content.
 - 2. Particleboard and MDF: Provide particleboard and MDF with minimum 80 percent recycled content. Provide plastic panels with recycled content.
- D. Composite Wood [Installed Within the Building Interior]: Comply with California Air Resources Board (CARB) Airborne Toxic Control Measure (ATCM), Phase II for ultra-low-emitting formaldehyde (ULEF) resins or containing no formaldehyde resins.

2.2 MANUFACTURERS

- A. Source Limitations: Obtain flush wood doors from single manufacturer.
- B. Basis-of-Design Manufacturer: JELD-WEN, Inc.; www.jeld-wen.com.
- C. Other Approved Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Masonite; masonite.com.
 - 2. Oregon Door; www.oregondoor.com.
 - 3. Oshkosh Door Co.; www.oshkoshdoor.com.
 - 4. Rogue Valley Door; www.roguevalleydoor.com.
 - 5. Vancouver Door Co.; www.vancouverdoorco.com.
 - 6. VT Industries Inc.; www.vtindustries.com.

2.3 FLUSH WOOD DOORS, GENERAL

- A. All Composite Wood products shall be made using ultra-low-emitting formaldehyde (ULEF) resins as defined in the California Air Resources Board's "Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products" (CARB Phase II) or shall be made with no added formaldehyde (NAF).
- B. Quality Standard: In addition to requirements specified, comply with AWI's, AWMAC's, and WI's "Architectural Woodwork Standards.
- C. WDMA I.S.1-A Performance Grade: Heavy-Duty unless otherwise indicated.
- D. 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.
- E. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control, based on testing according to UL 1784.
- F. Particleboard-Core Doors: Not permitted unless otherwise indicated.
- G. Structural-Composite-Lumber-Core Doors:
 - 1. Structural Composite Lumber: WDMA I.S.10.
 - a. Screw Withdrawal, Face: 700 lbf (3100 N).
 - b. Screw Withdrawal, Edge: 400 lbf (1780 N).

2.4 SOLID-CORE WOOD VENEER-FACED DOORS

- A. Interior Doors for Transparent Finish:
 - 1. Architectural Woodwork Standards Grade: Premium.

2. Performance Grade: ANSI/WDMA I.S. 1A Heavy Duty.
 3. Faces: Single-ply wood veneer not less than 1/50 inch (0.508 mm) thick.
 - a. Species: As selected by Architect.
 - b. Cut: As selected by Architect.
 - c. Grade: As selected by Architect.
 4. Veneer Matching:
 - a. Match between Veneer Leaves: Book match.
 - b. Assembly of Veneer Leaves on Door Faces: Center-balance match.
 - c. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
 - d. 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.
 5. Exposed Vertical and Top Edges: Same species as faces, 3-7/8 inches deep.
 6. Core: Either glued or nonglued block or WDMA I.S. 10 structural composite lumber.
 - a. Particle board is acceptable for non-bathroom spaces and closets.
 7. Core for Fire-Rated Doors: As required to achieve fire-protection rating indicated on Drawings.
 8. Construction: Five plies, hot-pressed, bonded (vertical and horizontal edging is bonded to core), with entire unit abrasive planed before veneering.
 9. Frames, at Pre-hung Units: Any closed-grain hardwood of mill option; manufacturer's standard for product selected by Architect. See Section 06 40 00 for non-standard frame sizes.
 10. Finish: Field-painted to match adjacent wall.
 11. Application: Community rooms and Offices.
- B. Fire-Rated Doors Construction: Provide fire-rating as scheduled.
1. Construction: Construction and core specified above for type of face indicated or manufacturer's standard mineral-core construction as needed to provide fire rating indicated.
 2. Blocking: For mineral-core doors, provide composite blocking with improved screw-holding capability approved for use in doors of fire ratings indicated as needed to eliminate through-bolting hardware.
 3. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile matching face veneer, and laminated backing at hinge stiles for improved screw-holding capability and split resistance.
 4. Pairs: Provide fire-rated pairs with fire-retardant stiles matching face veneer that are labeled and listed for kinds of applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals.

2.5 HOLLOW-CORE FLUSH WOOD VENEER-FACED DOORS

A. Interior Doors and Sliding Wardrobe Doors:

1. Performance Grade: ANSI/WDMA I.S. 1A Standard Duty.
2. Transparent Finish Doors:
 - a. Species: As selected by Architect.
 - b. Cut: As selected by Architect.
 - c. Grade: As selected by Architect.
 - d. Finish: Semi-Gloss.
3. Veneer Matching:
 - a. Match between Veneer Leaves: Book match.
 - b. Assembly of Veneer Leaves on Door Faces: Center-balance match.
 - c. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
 - d. 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.
4. Exposed Vertical and Top Edges: Same species as faces or a compatible species - Architectural Woodwork Standards edge Type A.
5. Construction: Standard hollow core.
6. Blocking: Provide wood blocking with minimum dimensions as required.

2.6 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: Flat/ straight 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 on Drawings. Include concealed metal glazing clips where required for opening size and fire-protection rating indicated.
- C. Metal Frames for Light Openings in Fire-Rated Doors: Manufacturer's standard frame formed of 0.048-inch-thick, cold-rolled steel sheet; factory primed for paint finish; and approved for use in doors of fire-protection rating indicated on Drawings.

2.7 FABRICATION

- A. Fabricate doors in sizes indicated for Project-site fitting.
- B. Factory fit doors to suit frame-opening sizes indicated, with the following uniform clearances and bevels, unless otherwise indicated:
1. Comply with clearance requirements of referenced quality standard for fitting. Comply with requirements in NFPA 80 for fire-rated doors.

- C. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.
 - 1. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before factory machining.
 - 2. For doors scheduled to receive electrified locksets, provide factory-installed raceway and wiring to accommodate specified hardware.
 - 3. Metal Astragals: Premachine astragals and formed-steel edges for hardware for pairs of fire-rated doors.
- D. Transom and Side Panels:
 - 1. Fabricate matching panels with same construction, exposed surfaces, and finish as specified for associated doors.
 - 2. Finish bottom edges of transoms and top edges of rabbeted doors same as door stiles.
 - 3. Fabricate door and transom panels with full-width, solid-lumber meeting rails.
 - 4. Provide factory-installed spring bolts for concealed attachment into jambs of metal door frames.
- E. 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 80 00 "Glazing."

2.8 SLIDING DOOR HARDWARE

- A. Coordinate with Section 08 71 00 "Door Hardware" for swinging door hardware and general requirements.
- B. Sliding Door Hardware: BHMA A156.14; consisting of complete sets including rails, hangers, supports, bumpers, floor guides, and accessories indicated.
- C. Frame: Extruded aluminum, Type 6063, of temper recommended by producer for type of use and finish indicated; heavy-duty, commercial quality.
 - 1. Opening Size: As indicated on Drawings.
- D. Track and Channel: Extruded aluminum, Type 6063, of temper recommended by producer for type of use and finish indicated; long edges returned or rolled and ends capped. Channel encloses operating mechanisms including carriers.
- E. Carriers: 1-1/2 in. diameter nylon wheels with hardened steel races and 5/32 in. ball bearings in extra-heavy 18 gauge steel housing with height-adjustment capability.
- F. Door Pulls: Recessed; compliant with ADA requirements.

2.9 FACTORY FINISHING

- A. Comply with referenced quality standard for factory finishing.
 - 1. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
 - 2. Finish faces, all four edges, edges of cutouts, and mortises.
 - 3. 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: Manufacturer's standard UV cured polyurethane equal to WDMA TR-6 catalyzed polyurethane or WDMA TR-8/AWS System 9 (UV Cured Acrylated Polyurethane).
 - 3. Staining: As selected by Architect .
 - 4. Effect: Open-grain finish.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and installed door frames before hanging doors.
 - 1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
 - 2. Reject doors with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Hardware: For installation, see Division 08 Sections "Door Hardware."
- B. Manufacturer's Written Instructions: Install doors to comply with manufacturer's written instructions, referenced quality standard, and as indicated.
 - 1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.
- C. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal cut surfaces after fitting and machining.
 - 1. Clearances: Provide 1/8 inch at heads, jambs, and between pairs of doors. Provide 1/8 inch from bottom of door to top of decorative floor finish or covering. Where threshold is shown or scheduled, provide 1/4 inch from bottom of door to top of threshold.
 - a. Comply with NFPA 80 for fire-rated doors.
 - 2. Bevel non-fire-rated doors 3-1/2 degrees at lock and hinge edges.
- D. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- E. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. Finished Doors: Replace doors that are damaged or 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

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SECTION 08 16 13 - FIBERGLASS DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Fiberglass reinforced plastic doors.
 - 2. Accessories.
- B. Related Requirements:
 - 1. Section 08 11 13 "Hollow Metal Doors and Frames" for coordination with frames.
 - 2. Section 08 71 00 "Door Hardware" for coordination with hardware.

1.3 COORDINATION

- A. Coordinate the work with door opening construction, door frame and door hardware installation.
- B. Obtain hardware templates from hardware manufacturer prior to starting fabrication.

1.4 SUBMITTALS

- A. Product Data: Provide manufacturer's standard details, installation instructions, and hardware and anchor recommendations.
- B. Shop Drawings: Show layout and profiles; include assembly methods.
 - 1. Indicate product components, including hardware reinforcement locations and preparations, accessories, finish colors, patterns, and textures.
 - 2. Indicate wall conditions, door and frame elevations, sections, materials, gages, finishes, location of door hardware by dimension, and details of openings; use same reference numbers indicated on Drawings to identify details and openings.
- C. Samples for Initial Selection: Submit two complete sets of color chips, illustrating manufacturer's available finishes, colors, and textures.
- D. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer; include detailed terms of warranty.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in installing products of the type specified in this Section with not less than three years of documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- B. Store materials in original packaging, under cover, protected from exposure to harmful weather conditions and from direct contact with water.
 - 1. Store at temperature and humidity conditions recommended by manufacturer.

2. Do not use non-vented plastic or canvas shelters.
3. Immediately remove wet wrappers.
- C. Store in position recommended by manufacturer, elevated minimum 4 inches above grade, with minimum 1/4 inches space between doors.

1.7 FIELD CONDITIONS

- A. Maintain temperature and humidity at manufacturer's recommended levels during and after installation of interior doors.

1.8 WARRANTY

- A. Provide five (5) year manufacturer warranty covering materials and workmanship, including degradation or failure due to chemical contact.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain fiberglass doors from single manufacturer.
- B. Approved Manufacturers:
 1. Cascadia Windows Ltd.; www.cascadiawindows.com.
 2. Jeld-Wen, Inc.; www.jeld-wen.com.
 3. Pella Corp.; www.pella.com.

2.2 DOOR ASSEMBLIES

- A. Basis-of-Design Product: As selected by Architect.
 1. Panel Type: Flush; or as indicated.
 2. Finish and Texture: Manufacturer's standard baked-on or gel coating; smooth.
 - a. Color: As selected by Architect from manufacturer's full range.
 3. Thickness: 1-3/4 inches.
- B. Door Assemblies: Factory-fabricated, prepared and machined for hardware.
 1. Mechanical Durability: Tested to ANSI A250.4 Level A (1,000,000 cycles), minimum; tested with hardware and fasteners intended for use on project.
 2. Screw-Holding Capacity: Tested to 900 psi, minimum.
 3. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less; when tested in accordance with ASTM E84.
 4. Flammability: Self-extinguishing when tested in accordance with ASTM D635.

2.3 FABRICATION

- A. Doors: Through-color gel coating on fiberglass reinforced polyester resin construction with reinforced core.
- B. Door Construction: Molded in one piece including gel coating on all sides; manufacturer's standard subframe, core and faces fused during cure in mold; hardware reinforcements
- C. Subframe and Reinforcements: Fiberglass pultrusions or polymer foam; no metal or wood.

- D. Waterproof Integrity: All edges, cut-outs, and hardware preparations factory fabricated of fiberglass reinforced plastic; provide cut-outs with joints sealed independently of glazing or louver inserts or trim.
- E. Hardware Preparations: Factory reinforce, machine, and prepare for all hardware including field installed items; provide solid blocking for each hardware item; make field cutting, drilling or tapping unnecessary; obtain manufacturer's templates for hardware preparations.
- F. Bottom Rail: Provide height necessary to allow up to 1-1/4 inches to be field cut off bottom of door without impairing door strength or durability.
- G. Gel Coating Finish: Ultraviolet stabilized polyester, marine grade NPG-isophthalic, with smooth textured semi-gloss finish.
 - 1. Thickness: Minimum 15 mils wet, plus/minus 3 mils.

2.4 ACCESSORIES

- A. Glazing Stops: Pultruded fiberglass unless otherwise indicated or required by fire rating; provided by door manufacturer to fit factory made openings, color and texture to match door; fasteners not penetrating waterproof integrity.
 - 1. Exterior Doors: Provide non-removable stops on outside and continuous compression gasket weatherseal.
 - 2. Glazed Openings: Provide removable stops on one side.
 - 3. Opening Sizes: As indicated on Drawings.
 - 4. Stop Profile: Flush, square profile stops, sloped to drain at exterior.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify actual dimensions of openings by field measurements before door fabrication; show recorded measurements on shop drawings.
- B. Do not begin installation until substrates have been properly prepared.
- C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- B. Clean and prepare substrate in accordance with manufacturer's directions.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions; do not penetrate frames with anchors.
- B. Set units plumb, level, and true-to-line, without warping or racking doors, and with specified clearances; anchor in place.
- C. Repair or replace damaged installed products.

3.4 ADJUSTING

- A. Lubricate, test, and adjust doors to operate easily, free from warp, twist or distortion, and to fit watertight for entire perimeter.
- B. Adjust hardware for smooth and quiet operation.

- C. Adjust doors to fit snugly and close without sticking or binding.

3.5 CLEANING

- A. Clean installed products in accordance with manufacturer's instructions prior to owner's acceptance.

3.6 PROTECTION

- A. Protect installed products from damage during subsequent work.

3.7 SCHEDULE

- A. Refer to Door and Frame Schedule in Drawings.

END OF SECTION

SECTION 08 31 13 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Wall access doors and frames.
 - 2. Ceiling access doors and frames.

1.3 SUBMITTALS

- A. Product Data: For each type of door and frame indicated. Include construction details relative to materials, individual components and profiles, finishes, and fire ratings (if required) for access doors and frames.
- B. Schedule: Provide complete door and frame schedule, including types, general locations, sizes, construction details, latching or locking provisions, and other data pertinent to installation.
- C. Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items with concealed framing, suspension systems, piping, ductwork, and other construction. Show the following:
 - 1. Method of attaching door frames to surrounding construction.
 - 2. Ceiling-mounted items including access doors and frames, lighting fixtures, diffusers, grilles, speakers, sprinklers, and special trim.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain doors and frames through one source from a single manufacturer.
- B. 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 per the following test method and that are labeled and listed by UL, ITS, or another testing and inspecting agency acceptable to authorities having jurisdiction:
 - 1. NFPA 252 or UL 10B for vertical access doors.
 - 2. ASTM E 119 or UL 263 for horizontal access doors and frames.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Manufacturer:
 - 1. Acudor, a division of Nelson Industrial Inc.; www.acodor.com.
- B. Other Approved Manufacturers:
 - 1. Babcock-Davis; www.babcockdavis.com.
 - 2. Mifab, Inc.; www.mifab.com.
 - 3. Milcor, div. of Hart & Cooley, Inc.; www.milcorinc.com.

4. Or approved equal.

2.2 ACCESS DOORS AND FRAMES

A. Flush, Insulated, Non Fire-Rated Access Doors and Frames with Concealed Trim:

1. Basis-of-Design Products:
 - a. At Gypsum Board Finish: Factory-primed steel recessed door to receive gypsum board to match adjacent wall surfaces or ceilings.
 - 1) DW-5058 Recessed Access Door by Acudor.
 - 2) Or approved equal.
2. Hinges: Concealed pin type.
3. Automatic Closer: Spring type. At wall units only.
4. Latch: Self-latching bolt operated by key with interior release.
5. Lock: Key-operated cylinder lock, with interior release.

B. Flush, Insulated, Fire-Rated Access Doors with Concealed Trim:

1. Basis-of-Design Products:
 - a. At Gypsum Board Finish: Factory-primed steel recessed door to receive gypsum board to match adjacent wall surfaces or ceilings.
 - 1) Walls: FW-5015 Fire Rated Access Door by Acudor.
 - a) Or approved equal.
 - 2) Ceilings: FWC-5015 Fire Rated Access Door by Acudor.
 - a) Or approved equal.
2. Rating: Match wall, partition or ceiling assembly rating indicated.

C. Size: As indicated or as required.

2.3 MATERIALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Hot-Rolled Steel Sheets: ASTM A 569/A 569M, Commercial Steel (CS), Type B; free of scale, pitting, and surface defects; pickled and oiled; with minimum thickness indicated representing specified nominal thickness according to ASTM A 568/A 568M.
- C. Cold-Rolled Steel Sheets: ASTM A 366/A 366M, Commercial Steel (CS), or ASTM A 620/A 620M, Drawing Steel (DS), Type B; stretcher-leveled standard of flatness; with minimum thickness indicated representing specified nominal thickness according to ASTM A 568/A 568M. Electrolytic zinc-coated steel sheet, complying with ASTM A 591/A 591M, Class C coating, may be substituted at fabricator's option.
- D. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 316; with minimum sheet thickness indicated representing specified thickness according to ASTM A 480/A 480M.
- E. Drywall Beads: Edge trim formed from 0.03-inch (0.76-mm) zinc-coated steel sheet formed to receive joint compound and in size to suit thickness of gypsum board.
- F. Plaster Bead: Casing bead formed from 0.03-inch (0.76-mm) zinc-coated steel sheet with flange formed out of expanded metal lath and in size to suit thickness of plaster.

2.4 FABRICATION

- A. General: Provide access door 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. Steel Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of supports indicated.
 - 1. Exposed Flanges: Nominal 1 to 1-1/2 inches (25 to 38 mm) wide around perimeter of frame.
 - 2. For trimless frames with plaster bead for full-bed plaster applications, provide zinc-coated expanded metal lath and exposed casing bead welded to perimeter of frames.

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. Painted Finishes: Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
 - 1. Factory Primed: Apply manufacturer's standard, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.
 - 2. Factory Finished: Apply manufacturer's standard baked-enamel or powder-coat finish immediately after cleaning and pretreating, with minimum dry-film thickness of 1 mil (0.025 mm) for topcoat.
 - a. Color: As selected by Architect from full range of industry colors.
- E. Stainless Steel Finishes:
 - 1. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
 - 2. Polished Finish: ASTM A480/A480M No. 4 finish. Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - a. Run grain of directional finishes with long dimension of each piece.
 - b. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Advise installers of other work about specific requirements relating to access door and floor door installation, including sizes of openings to receive access door and frame, as well as locations of supports, inserts, and anchoring devices.

3.2 INSTALLATION

- A. Set frames accurately in position and attach securely to supports with plane of face panels aligned with adjacent finish surfaces.
- B. Install recessed finish material.

3.3 ADJUSTING AND CLEANING

- 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

SECTION 08 41 13 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Aluminum-framed storefront system.
 - 2. Aluminum-framed entrance doors (SWING DOOR).
 - 3. Delegated design.
- B. Related Requirements:
 - 1. Section 01 61 16 "Delegated Design Requirements" for delegated design for deferred submittal.
 - 2. Section 07 62 00 "Sheet Metal Flashing and Trim".
 - 3. Section 07 92 00 "Joint Sealants".
 - 4. Section 08 71 00 "Door Hardware".
 - 5. Section 08 80 00 "Glazing".

1.3 PREINSTALLATION MEETINGS

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

1.4 SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For aluminum-framed entrances and storefronts. Include plans, elevations, sections, full-size details, and attachments to other work.
 - 1. Include full-size isometric details of each type of 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.
 - 2. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.
 - 3. Include point-to-point wiring diagrams showing the following:
 - a. Power requirements for each electrically operated door hardware.
 - b. Location and types of switches, signal device, conduit sizes, and number and size of wires.

- C. Samples for Initial Selection: For units with factory-applied color finishes.
- D. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.
- E. Delegated-Design Submittal: For aluminum-framed entrances and storefronts 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 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For aluminum-framed entrances and storefronts to include in maintenance manuals.
- B. 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: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. Laboratory Mockup Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated.
- C. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated and accredited by the International Accreditation Service or the International Laboratory Accreditation Cooperation Mutual Recognition Arrangement as complying with ISO/IEC 17025.
- D. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.
 - 1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

1.7 WARRANTY

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

- B. Special Finish Warranty: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. 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. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design aluminum-framed entrances and storefronts.
- B. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
 - 1. Aluminum-framed entrances and storefronts shall withstand movements of supporting structure, including, but not limited to, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
 - 2. Failure also includes the following:
 - a. Thermal stresses transferring to building structure.
 - b. Glass breakage.
 - c. Noise or vibration created by wind and thermal and structural movements.
 - d. Loosening or weakening of fasteners, attachments, and other components.
 - e. Failure of operating units.
- C. Structural Loads:
 - 1. Wind Loads: As indicated on Structural Drawings.
 - 2. Other Design Loads: As indicated on Structural Drawings.
 - 3. Deflection of Framing Members: At design wind pressure, as follows:
 - a. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane not exceeding 1/175 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.
 - b. Deflection Parallel to Glazing Plane: Limited to amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components to less than 1/8 inch.
 - 1) Operable Units: Provide a minimum 1/16-inch clearance between framing members and operable units.
- D. Test according to ASTM E 330/E 330M as follows:
 - 1. When tested at positive and negative wind-load design pressures, storefront assemblies, including entrance doors, do not evidence deflection exceeding specified limits.

2. When tested at 150 percent of positive and negative wind-load design pressures, storefront assemblies, including entrance doors and anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
 3. Test Durations: As required by design wind velocity, but not less than 10 seconds.
- E. Air Infiltration: Test according to ASTM E 283 for infiltration as follows:
1. Entrance Doors:
 - a. Single Doors: Maximum air leakage of 0.5 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft..
 - b. Pair of Doors: Maximum air leakage of 1.0 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft..
 - c. Retain "Water Penetration under Static Pressure" Paragraph below for static-pressure method, which is most frequently specified. For water-penetration tests, AAMA 501 states that a static-air-pressure differential of 20 percent of wind-load design pressure provides satisfactory performance in most parts of the United States. Locations where high winds and heavy rains occur simultaneously require higher test-pressure differences. Both static and dynamic testing may be required or desired for certain designs, particularly those incorporating special water-drainage features, such as rain screen walls.
- F. 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, including entrance doors, when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft.
- G. 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: No uncontrolled water penetrating assemblies or water appearing on assemblies' normally exposed interior surfaces from sources other than condensation. Water leakage does not include water controlled by flashing and gutters, or water that is drained to exterior.
- H. 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.
- I. Energy Performance: Certify and label energy performance according to NFRC as follows:
1. Thermal Transmittance (U-factor): Fixed glazing and framing areas as a system 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 (SHGC): Fixed glazing and framing areas as a system shall have SHGC of no greater than 0.35 as determined according to NFRC 200.
- J. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes.

2.2 MANUFACTURERS

- A. Source Limitations: Obtain all components of storefront system, including framing, entrances and accessories, from single manufacturer.
- B. Basis-of-Design Manufacturer: Oldcastle BuildingEnvelope; www.obe.com.
- C. Other Approved Manufacturers:
 - 1. Arcadia Inc; www.arcadiainc.com.
 - 2. EFCO Corp; www.efcocorp.com.
 - 3. Kawneer North America; www.kawneer.com. U.S. Aluminum; div. of C.R. Laurence Co., Inc.; www.crlaurence.com.
 - 4. Wausau; www.wausauwindow.com.

2.3 ALUMINUM-FRAMED STOREFRONT SYSTEMS

- A. Aluminum Storefront System:
 - 1. Basis-of-Design Product: Series 3000 Thermal MultiPlane by Oldcastle.
- B. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
 - 1. Framing: 2 inches wide by 4-1/2 inches deep framing members, captured offset glazed at head and sill, 2-sided structural silicone vertical joints and at corners, screw spline, shear block, or compensating stick for 1-inch thick insulating glass units.
 - 2. Construction: Thermally-broken.
 - 3. Glazing System: Retained mechanically with gaskets on two sides.
 - 4. Glazing Plane: Front.
 - 5. Finish: High-performance organic finish; refer to Finishes article below.
 - 6. Fabrication Method: Field-fabricated stick system.
- C. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.
- D. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.
- E. 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/B 429M.
 - 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. Basis-of-Design Product, SWING DOOR: MS-375 Series Doors by Oldcastle.
- B. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing or automatic operation.
 - 1. Door Construction: 1-3/4-inch (44.5-mm) overall thickness, with minimum 0.125-inch- (3.2-mm-)thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.
 - 2. Door Design: Medium stile.
 - a. Stiles: 4-1/4 inches
 - b. Top Rail: 3-1/2 inches.
 - c. Bottom Rail: 8-1/2 inches.
 - 3. Glazing Stops and Gaskets: Beveled, snap-on, extruded-aluminum stops and preformed gaskets.
 - 4. Finish: Match adjacent storefront framing finish.

2.5 ENTRANCE DOOR HARDWARE

- A. Entrance Door Hardware: Hardware not specified in this Section is specified in Section 08 71 00 "Door Hardware."
- B. Cylinders: As specified in Section 08 71 00 "Door Hardware."
- C. Butt Hinges: BHMA A156.1, Grade 1, radius corner.
 - 1. Nonremovable Pins: Provide setscrew in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while entrance door is closed.
 - 2. Exterior Hinges: Stainless steel, with stainless-steel pin Nonferrous Insert material.
 - 3. Quantities:
 - a. For doors up to 87 inches high, provide three hinges per leaf.
 - b. For doors more than 87 and up to 120 inches high, provide four hinges per leaf.
- D. Mortise Auxiliary Locks: BHMA A156.5, Grade 1.
- E. Panic Exit Devices: BHMA A156.3, Grade 1, listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305.
- F. Strikes: Provide strike with black-plastic dust box for each latch or lock bolt; fabricated for aluminum framing.
- G. Operating Trim: BHMA A156.6.
- H. Closers: BHMA A156.4, Grade 1, with accessories required for a complete installation, sized as required by door size, exposure to weather, and anticipated frequency of use; adjustable to comply with field conditions and requirements for opening force.
- I. Concealed Overhead Holders and Stops: BHMA A156.8, Grade 1.
- J. Door Stops: BHMA A156.16, Grade 1, floor or wall mounted, as appropriate for door location indicated, with integral rubber bumper.

- K. Weather Stripping: Manufacturer's standard replaceable components.
 - 1. Compression Type: Made of ASTM D 2000 molded neoprene or ASTM D 2287 molded PVC.
 - 2. Sliding Type: AAMA 701/702, made of wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.
- L. Weather Sweeps: Manufacturer's standard exterior-door bottom sweep with concealed fasteners on mounting strip.
- M. Thresholds: BHMA A156.21 raised thresholds beveled with a slope of not more than 1:2, with maximum height of 1/2 inch.
- N. Finger Guards: Manufacturer's standard collapsible neoprene or PVC gasket anchored to frame hinge-jamb at center-pivoted doors.

2.6 GLAZING

- A. Glazing: Refer to Section 08 80 00 "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: Comply with Section 08 80 00 "Glazing."
- D. 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.
- E. 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. Automatic Door Operators: Section 08 71 00 "Door Hardware".
- B. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
 - 1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
 - 2. Reinforce members as required to receive fastener threads.
 - 3. Use exposed fasteners with countersunk Phillips screw heads, fabricated from 300 series stainless steel.
- C. 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.
- D. Bituminous Paint: Cold-applied asphalt-mastic paint containing no asbestos, formulated for 30-mil thickness per coat.
- E. Rigid PVC Filler.

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. 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 interior for vision glass and exterior for spandrel glazing or metal panels.
 - 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. Storefront Framing: Fabricate components for assembly using screw-spline system.
- G. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
 - 1. At interior and exterior doors, provide compression weather stripping at fixed stops.
- H. 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.
- I. 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.
- J. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.9 ALUMINUM FINISHES

- A. High-Performance Organic Finish: Two-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF or FEVE resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 1. Approved PVDF Resin Products:
 - a. Hylar 5000 by Solvay; www.solvay.com.
 - b. Kynar 500 by Arkema; www.kynar500.com.
 - 2. Approved Fluoropolymer Coating Products:
 - a. Duranar by PPG IdeaScapes; www.ppgideascales.com.

- b. Fluropon by Valspar Corp., div. of The Sherwin-Williams Co.;
www.valsparcoilextrusion.com.
- 3. Exposed Finish: Two-coat fluoropolymer (PVDF) finish.
- 4. Color: As selected by Architect.

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. Install components plumb and true in alignment with established lines and grades.
- D. Install operable units level and plumb, securely anchored, and without distortion. Adjust weather-stripping contact and hardware movement to produce proper operation.
- E. Install glazing as specified in Section 08 80 00 "Glazing."
- F. Install weatherseal sealant according to Section 07 92 00 "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. 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: Owner will 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.
- 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 six 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.
 - 2. Initial Maintenance Service: Beginning at Substantial Completion, provide six 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.

3.7 ENTRANCE DOOR HARDWARE SETS

- A. Refer to Section 08 71 00.01 "Door Hardware Sets".

END OF SECTION

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SECTION 08 53 15 - VINYL WINDOWS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Vinyl-framed windows.
- B. Related Requirements:
 - 1. Section 06 10 00 "Rough Carpentry" for coordination with opening framing.
 - 2. Section 07 62 00 "Sheet Metal Flashing and Trim".
 - 3. Section 07 92 00 "Joint Sealants".
 - 4. Section 08 80 00 "Glazing" for glazing requirements and coordination.

1.3 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 vinyl windows.
- B. Shop Drawings: For vinyl windows.
 - 1. Include plans, elevations, sections, hardware, accessories, insect screens, operational clearances, and details of installation, including anchor, flashing, and sealant installation.
- C. Samples: For each exposed product and for each color specified, 2 by 4 inches in size.
- D. Samples for Verification: For vinyl windows and components required, prepared on Samples of size indicated below:
 - 1. Exposed Finishes: 2 by 4 inches.
 - 2. Exposed Hardware: Full-size units.
- E. Product Schedule: For vinyl windows. Use same designations indicated on Drawings.
- F. Qualification Data: For manufacturer and Installer.
- G. Product Test Reports: For each type of vinyl window, for tests performed by a qualified testing agency.
 - 1. Provide documentation from window manufacturer indicating performance grade required per AAMA/WDMA/CSA 101/I.S.2/A440 for project wind speeds.
- H. Field quality-control reports.
- I. Sample Warranties: For manufacturer's warranties.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A manufacturer capable of fabricating vinyl 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 vinyl window manufacturer for installation of units required for this Project.

1.5 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace vinyl 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, and air infiltration.
 - c. Faulty operation of movable sash and hardware.
 - d. Deterioration of materials and finishes beyond normal weathering.
 - e. Failure of insulating glass.
 - 2. Warranty Period:
 - a. Window: 10 years from date of Substantial Completion.
 - b. Glazing Units: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Product Standard: Comply with AAMA/WDMA/CSA 101/I.S.2/A440 for definitions and minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.
 - 1. Window Certification: WDMA 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 or CW, per product indicated and type indicated on Drawings.
 - 2. Minimum Performance Grade: per product indicated and type indicated on Drawings.
 - a. Verify performance grade required based on location and elevation. Refer to Structural Drawings for Design Criteria.
- C. Thermal Transmittance: NFRC 100 maximum whole-window U-factor of 0.26 Btu/sq. ft. x h x deg F.
- D. Solar Heat-Gain Coefficient (SHGC):
 - 1. Casement: 0.18.
 - 2. Fixed: 0.22.
- E. Sound Transmission Class (STC): Rated for not less than 36 STC when tested for laboratory sound transmission loss according to ASTM E90 and determined by ASTM E413.
- F. Outside-Inside Transmission Class (OITC): Rated for not less than 30 OITC when tested for laboratory sound transmission loss according to ASTM E90 and determined by ASTM E1332.
- G. Water Penetration under Static Pressure: Test according to ASTM E331 as follows:
 - 1. No evidence of water penetration through fixed glazing and framing areas of entrance doors when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft. (300 Pa).

2.2 MANUFACTURERS

- A. Source Limitations: Obtain vinyl windows from single source from single manufacturer.
- B. Basis-of-Design Manufacturer: VPI Quality Windows (VPI); www.vpiwindows.com.
- C. Other Approved Manufacturers:
 - 1. Innotech Windows and Doors; www.innotech-windows.com.
 - 2. Jeld-Wen, Inc.; www.jeld-wen.com.
 - 3. Milgard Manufacturing; www.milgard.com.
 - 4. Rehau; www.rehau.com.

2.3 VINYL WINDOWS

- A. Basis-of-Design Product: Endurance Window Series by VPI.
 - 1. Operation: As indicated on Drawings.
- B. Frames and Sashes: Impact-resistant, UV-stabilized unplasticized PVC complying with AAMA/WDMA/CSA 101/I.S.2/A440.
 - 1. Finish: As indicated.
 - 2. Gypsum Board Returns: Provide at interior face of frame.
 - 3. Provide Nail-fin on all units, unless indicated otherwise.
 - 4. Provide integral steel-reinforcement in frame extrusion for fastening backing, U-shaped at all sides, where indicated. ASTM A1003/A1003M, 16 gauge, G60 (Z180) minimum sheet steel.

2.4 GLAZING

- A. Manufacturer's Factory Assembled Insulating-Glass Units: ASTM E2190.
 - 1. Overall Unit Thickness: 1 inch.
 - a. Outer Lite: 1/4-inch clear float glass, with manufacturer's low-e coating on no. 2 surface meeting the performance requirements for project.
 - b. Interspace Content: Argon (90 percent argon; 10 percent air).
 - c. Inner Lite: Fully tempered 1/4-inch clear float glass.
 - d. Edge Spacer: Black; warm-edge.
 - 2. Performance Requirements:
 - a. Winter Nighttime U-Factor: 0.29 Btu/(hr x sqft x °F).
 - b. Solar Heat Gain Coefficient (SHGC): 0.27 maximum.
 - c. Visual Light Transmittance (VLT): 64 percent.
 - 3. Provide safety glazing where required.

2.5 HARDWARE

- A. 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. Exposed Hardware Color and Finish: Color to match interior frames.

- B. Projected Window Hardware:
 - 1. Gear-Type Rotary Operators: Complying with AAMA 901 when tested according to ASTM E405, Method A. Provide operators that function without requiring the removal of interior screens or using screen wickets.
 - 2. Hinges: Manufacturer's standard type for sash weight and size indicated.
 - 3. Single-Handle Locking System: Operates positive-acting arms that pull sash into locked position. Provide one arm on sashes up to 29 inches tall and two arms on taller sashes.
- C. Hung Window Hardware:
 - 1. Counterbalancing Mechanism: Complying with AAMA 902, concealed, of size and capacity to hold sash stationary at any open position.
 - 2. Locks and Latches: Allow unobstructed movement of the sash across adjacent sash in direction indicated and operated from the inside only.
 - 3. Tilt Hardware: Releasing tilt latch allows sash to pivot about horizontal axis to facilitate cleaning exterior surfaces from the interior.
- D. Horizontal-Sliding Hardware:
 - 1. Sill Cap/Track: Manufacturer's standard of dimensions and profile indicated; designed to comply with performance requirements indicated and to drain to the exterior.
 - 2. Locks and Latches: Allow unobstructed movement of the sash across adjacent sash in direction indicated and operated from the inside only.
 - 3. Roller Assemblies: Low-friction design.
- E. Weather Stripping: Provide full-perimeter weather stripping for each operable sash unless otherwise indicated.
- F. Fasteners: Stainless steel; compatible with window members, trim, hardware, anchors, and other components.
 - 1. Exposed Fasteners: Do not use exposed fasteners to greatest extent possible. For application of hardware, use fasteners that match finish hardware being fastened.

2.6 INSECT SCREENS

- A. General: Fabricate insect screens to integrate with window frame. Provide screen for each operable exterior sash. Screen wickets are not permitted.
 - 1. Type and Location: Provide on all operable units. Full, inside for project-out sashes.
- B. Glass-Fiber Mesh Fabric: Mesh of PVC-coated, glass-fiber threads; woven and fused to form a fabric mesh resistant to corrosion, shrinkage, stretch, impact damage, and weather deterioration. Comply with ASTM D3656/D3656M.
 - 1. Mesh Color: Manufacturer's standard.

2.7 FABRICATION

- A. Fabricate vinyl windows in sizes indicated. Include a complete system for installing and anchoring windows.
- B. Glaze vinyl windows in the factory.
- C. Weather strip each operable sash to provide weathertight installation.
- D. Mullions: Provide mullions and cover plates, compatible with window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections. Provide

mullions and cover plates capable of withstanding design wind loads of window units. Provide manufacturer's standard finish to match window units.

- E. Hardware: Mount hardware through double walls of vinyl extrusions or provide corrosion-resistant reinforcement.
- F. 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. Allow for scribing, trimming, and fitting at Project site.

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 ASTM E2112.
- B. Install windows level, plumb, square, true to line, without distortion, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction to produce weathertight construction.

3.3 FIELD QUALITY CONTROL

- A. Testing Services: Testing and inspecting of installed windows shall take place as follows:
 - 1. Testing Methodology: Testing of windows for air infiltration and water resistance shall be performed according to ASTM E1105 and as indicated.
 - 2. Air-Infiltration Testing:
 - a. Test Pressure: That required to determine compliance with AAMA/WDMA/CSA 101/I.S.2/A440 performance class indicated.
 - b. Allowable Air-Leakage Rate: 1.5 times the applicable AAMA/WDMA/CSA 101/I.S.2/A440 rate for product type and performance class rounded down to one decimal place.
 - 3. Water-Resistance Testing:
 - a. Test Pressure: Two-thirds times test pressure required to determine compliance with AAMA/WDMA/CSA 101/I.S.2/A440 performance grade indicated.
 - b. Allowable Water Infiltration: No water penetration.
 - 4. Testing Extent: Three windows of each type as selected by Architect and a qualified independent testing and inspecting agency. Windows shall be tested after perimeter sealants have cured.
 - a. Test three windows, at locations selected by Architect, at 15 percent, 60 percent and 85 percent competition.

- 5. Testing shall occur prior to the installation of interior finishes and prior to exterior finishes around windows at all locations.
- 6. Testing shall occur in conjunction with opening testing specified in other Sections.
- 7. Test Reports: Prepared according to ASTM E1105.
- B. Windows will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

3.4 ADJUSTING, CLEANING, AND PROTECTION

- A. Adjust operating sashes and hardware for a tight fit at contact points and weather stripping for smooth operation and weathertight closure.
- B. Clean exposed surfaces immediately after installing windows. Remove excess sealants, glazing materials, dirt, and other substances.
 - 1. Keep protective films and coverings in place until final cleaning.
- C. Remove and replace sashes if glass has been broken, chipped, cracked, abraded, or damaged during construction period.
- D. 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

SECTION 08 71 00 – 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. Work under this section includes the complete finish hardware requirements for the project. Quantities listed are for the contractor's convenience only and are not guaranteed. Items not specifically mentioned, but necessary to complete the work shall be furnished, matching the items specified in quality and finish.
- B. Related Sections:
 - 1. Section 08 11 13 "Hollow Metal Doors and Frames".
 - 2. Section 08 14 16 "Flush Wood Doors".
 - 3. Section 08 41 13 "Aluminum-Framed Entrances and Storefronts".
 - 4. Section 08 53 13 "Vinyl Windows".

1.3 QUALITY ASSURANCE

- A. Product Qualification:
 - 1. To assure a uniform high quality of materials for the project, it is intended that only specified items be furnished. Comparable products may be accepted upon prior approval of architect.
 - 2. Hardware to be new, free of defects, blemishes and excessive play. Obtain each kind of hardware (Mechanical latch and locksets, exit devices, hinges and closers) from one manufacturer except where specified.
 - 3. Fire-Rated opening in compliance with NFPA80. Hardware UL10C/UBC-7-2 (positive pressure) compliant for given type/size opening and degree of label. Provide proper latching hardware, non-flaming door closers, approved bearing hinges and smoke seal. Furnish openings complete.
- B. Supplier Qualifications:
 - 1. Hardware supplier will be a direct factory contract supplier who employs a certified Architectural Hardware Consultant (AHC) available at all reasonable times during the course of the work for project hardware consultation to owner, architect and contractor.
 - 2. Supplier will be responsible for detailing, scheduling and ordering of finish hardware.
 - 3. Conduct pre-installation conference at jobsite. Initiate and conduct with supplier, installer and related trades. Coordinate materials and techniques and sequence complex hardware items and systems installation.
 - 4. Key Conference shall be initiated and conducted with owner to determine system, keyway(s) and structure.
- C. Installer Qualifications:
 - 1. Installer to have not less than 3 years' experience specializing in installation of work in this section. Company must maintain qualified personnel trained and experienced in installing hardware.

1.4 REFERENCES

- A. NFPA80 – Fire Doors and Windows
- B. NFPA101 – Life Safety Code
- C. NFPA105 – Smoke and Draft Control Door Assemblies
- D. ANSI A117.1–Accessible and Usable Buildings and Facilities
- E. OSSC 2014 – Oregon Structural Specialty Code

1.5 SUBMITTALS

- A. Hardware Schedule: Submit digital copies of schedule. Organize vertically formatted schedule into Hardware Sets with index of doors and headings, indication complete designations of every item required for each door or opening. Include the following:
 - 1. Type, style, function, size, quantity and finish of hardware items.
 - 2. Name, part number and manufacture of each item.
 - 3. Fastenings and other pertinent information.
 - 4. Explanation of abbreviations, symbols and codes contained in schedule.
 - 5. Door and frame sizes, materials and degrees of swing.
- B. Product Data: Submit digital copies for each product indicated.
- C. Maintenance Data: For each type of door hardware to include in maintenance manuals specified in Division 01.
- D. Keying Schedule: Prepared by or under the supervision of supplier, after receipt of the approved finish hardware schedule, detailing Owner's final keying instructions for locks.
- E. Samples: Upon request submit material samples.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, handle and protect products to project site under provisions of Division 01 and as specified herein.
- B. Tag each item or package separately, with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.
- C. Deliver keys to Owner by registered mail.

1.7 WARRANTY

- A. The finish hardware shall have a limited warranty against defects in workmanship and operation for a period of one year from date of substantial completions and the following items are as shown:
 - 1. Closers: Thirty years mechanical, two years electrical.
 - 2. Exit Devices: Three years mechanical, one year electrical.
 - 3. Locksets: Three years mechanical, one year electrical.

PART 2 - PRODUCTS

2.1 MATERIAL AND FABRICATION

- A. Provide all door hardware for complete work, in accordance with the drawings and as specified herein.

- B. Provide items and quantities not specifically mentioned to ensure a proper and complete operational installation.

2.2 MANUFACTURERS

- A. Approval of products from manufacturers indicated as "Acceptable Manufacturer" is contingent upon those products providing all functions and features and meeting all requirements of scheduled manufacturer's product.

ITEM	SCHEDULED MANUFACTURER	OTHER ACCEPTABLE MANUFACTURER
Hinges	Stanley (ST)	Bommer, PBB
Continuous Hinges	Stanley (ST)	ABH, Select
Flush Bolts & Coordinators	Trimco (TR)	DCI
Locksets & Deadlocks	Stanley Commercial (SH)	None
Exit Devices	Stanley Commercial (SH)	Precision, Dorma
Electric Strikes	RCI (RC)	Hess, Folger Adam
Cylinders & Keying	Stanley Commercial (SH)	None
Door Closers	Stanley Commercial (SH)	Dorma, LCN
Automatic Operators	Dorma	None
Door Trim	Trimco	Rockwood, Don Jo
Protection Plates	Trimco	Rockwood, Don Jo
Overhead Stops	Dorma (DM)	ABH, Ives
Thresholds & Weatherstrip	Pemko (PE)	National Guard,, Reese

2.3 HANGING

- A. Conventional Hinges: Hinge open width minimum, but of sufficient throw to permit maximum door swing. Steel or stainless steel pins:
- Three hinges per leaf to 7 feet, 6-inch height. Add one for each additional 30 inches in height or any fraction thereof.
 - Provide 4-1/2 x 4-1/2 for 1-3/4 inch thick doors up to 35 inches. Provide heavy weight 5 x 4-1/2 for 1-3/4 inch thick doors 36 inches and over.
 - Outswinging locked doors to have non removable (NRP) pins.
 - Pin tips, flat button, finish to match leaves.
 - Doors over 36 inches: Heavy weight.
 - Doors up to 36 inches: Standard weight.

2.4 LOCKSETS, LATCHSETS, DEADBOLTS

- A. Heavy Duty Mortise Locks and Latches: [Owner standard].
- Provide mortise locks certified as ANSI A156.13, Grade 1 Operational, Grade 1 Security.
 - Provide lock case that is multi-function and field reversible for handing without opening case, and manufactured from heavy gauge steel, containing components of steel with a zinc dichromate plating for corrosion resistance.
 - Provide locks with standard 2-3/4 inches (70 mm) backset with full 3/4 inch (19 mm) throw stainless steel mechanical anti-friction latchbolt. Provide deadbolt with full 1 inch (25 mm) throw, constructed of stainless steel.
 - Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.

5. Provide electrified options as scheduled in the hardware sets. Provide electrified locksets with micro switch (RX) option that monitors retractor crank, and is actuated when rotation of inside or outside lever rotates retractor hub. Provide normally closed contacts or normally open contacts as required by security system.
6. Lever Trim: Solid brass, bronze, or stainless steel, cast or forged in design specified, with wrought roses and external lever spring cages. Provide thru-bolted levers with 2-piece spindles.
 - a. Lever Design: Owner standard.

2.5 EXIT DEVICES

A. Panic and Fire Rated Exit Devices: Owner standard.

1. Provide exit devices tested to ANSI/BHMA A156.3 Grade 1, AND UL listed for Panic Exit or Fire Exit Hardware.
2. Provide touchpad type exit devices, fabricated of brass, bronze, stainless steel, or aluminum, plated to standard architectural finishes to match balance of door hardware.
3. Quiet Operation: Incorporate fluid damper or other device that eliminates noise of exit device operation.
4. Touchpad: Extend minimum of one half of door width, but not the full length of exit device rail. Provide end-cap with two-point attachment to door. Provide compression springs in devices, latches, and outside trims or controls; tension springs prohibited.
5. Provide exit devices with deadlatching feature for security and for future addition of alarm kits and/or other electrical requirements.
6. Concealed Vertical Cable Exit Devices: Cable-actuated concealed vertical latch system in two-point and less bottom latch (LBL) configurations. Vertical rods not permitted.
 - a. Cable: Stainless steel core wire in stainless steel with polytetrafluoroethylene (Teflon) liner color-coded to latches and center slides. Conduit and core wire ends snap into latch and center slides without use of tools.
 - b. Latchbolts and Blocking Cams: Manufactured from sintered metal low carbon copper- infiltrated steel, with molybdenum disulfide low friction coating.
 - c. Top Latchbolt: Minimum 0.382 inch (10 mm) and greater than 90degree engagement with strike to prevent door and frame separation under high static load.
 - d. Bottom Latchbolt: Minimum of 0.44 inch (11 mm) engagement with strike.
 - e. Product Cycle Life: 1,000,000 cycles.
 - f. Latch Operation: Top and bottom latch operate independently of each other. Top latch fully engages top strike even when bottom latch is compromised. Separate trigger mechanisms not permitted.
 - g. Latch release does not require separate trigger mechanism.
7. Provide exit devices with manufacturer's approved strikes.
8. Provide exit devices cut to door width and height. Locate exit devices at height recommended by exit device manufacturer, allowable by governing building codes, and approved by Architect.
9. Mount mechanism case flush on face of doors, or provide spacers to fill gaps behind devices. Where glass trim or molding projects off face of door, provide glass bead kits.

10. Removable Mullions: 2 inches (51 mm) x 3 inches (76 mm) steel tube. Where scheduled as keyed removable mullion that is removed by use of a keyed cylinder, which is self-locking when re-installed.
11. Provide factory drilled weep holes for exit devices used in full exterior application, highly corrosive areas, and where noted in hardware sets.
12. Provide electrified options as scheduled in the hardware sets.
13. Where lever handles are specified as outside trim for exit devices, provide heavy-duty lever trims with forged or cast escutcheon plates. Provide vandal-resistant levers that will travel to 90-degree down position when more than 35 pounds of torque are applied, and which can easily be re-set.
 - a. Lever Style: Match lever style of locksets.

2.6 ELECTRIC STRIKES

- A. Manufacturers and Products: Owner standard.
 1. Provide electric strikes designed for use with type of locks shown at each opening.
 2. Provide electric strikes UL Listed as burglary-resistant.
 3. Where required, provide electric strikes UL Listed for fire doors and frames.
 4. Provide fail-secure type electric strikes, unless specified otherwise.
 5. Coordinate voltage and provide transformers and rectifiers for each strike as required.

2.7 KEYS, KEYING, AND KEY CONTROL

- A. See Keying Requirements in this section.

2.8 CLOSERS

- A. Surface Closers: Owner standard.
 1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. ISO 9000 certify closers. Stamp units with date of manufacture code.
 2. Provide door closers with fully hydraulic, full rack and pinion action with high strength cast iron cylinder, and full complement bearings at shaft.
 3. Cylinder Body: 1-1/2 inch (38 mm) diameter with 3/4 inch (19 mm) diameter double heat-treated pinion journal.
 4. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
 5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.
 6. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and backcheck.
 7. Provide closers with solid forged steel main arms and factory assembled heavy-duty forged forearms for parallel arm closers.
 8. Pressure Relief Valve (PRV) Technology: Not permitted.
 9. Finish for Closer Cylinders, Arms, Adapter Plates, and Metal Covers: Powder coating finish which has been certified to exceed 100 hours salt spray testing as described in ANSI Standard A156.4 and ASTM B117, or has special rust inhibitor (SRI).

10. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

2.9 AUTOMATIC OPERATORS

A. Pneumatic automatic operator: Owner standard.

1. Provide low energy automatic operator units that are pneumatically powered complying with ANSI/BHMA A156.19.
2. Provide units with conventional door closer opening and closing forces unless power operator motor is activated. Provide door closer assembly with adjustable spring size, back-check, and opening and closing speed adjustment valves to control door:
 - a. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
 - b. Power: Continuously adjustable over full range of closer sizes, with reduced opening force for physically handicapped.
 - c. Regulation: By tamper-proof, non-critical valves. Provide closers with separate adjustment for latch speed, general speed, and backcheck.
3. Provide separate conduits to carry high and low voltage wiring in compliance with National Electric Code, section 725-31.
4. When obstruction or resistance to opening swing is encountered, operator continues attempting to open door.
5. Provide operator designed to prevent damage to mechanism if system is actuated while door is latched or if door is forced closed during opening cycle.
6. Locate power unit and exhaust away from door to minimize noise and vibration in pedestrian areas.
7. Provide drop plates, brackets, or adapters for arms as required for details.
8. Provide hard-wired actuator switches for operation as specified. Provide weather-resistant actuators at exterior applications.
9. Provide complete assemblies of compressor, control boxes, tubing, switches, power supplies, relays, and parts/material recommended and approved by manufacturer of automatic operator for each individual leaf. Actuators control both doors simultaneously at pairs. Sequence exterior and vestibule doors with automatic operators to allow ingress or egress through both sets of openings as directed by Architect. Locate actuators and other controls as directed by Architect. Consult manufacturer for applications where tubing is run in rated plenums.
10. Provide control box or module with inputs and outputs, which allow sequencing operation, fire alarm system connections, actuators, swing side sensors, stop sensors, and SPDT relay for interfacing with latching or locking devices. Where required provide control box for "blow open" operation controlled by smoke evacuation system.

2.10 OTHER HARDWARE

A. Pocket Door Frame, Track and Lock:

1. Basis-of-Design Product: CS CL400-ADA Magnetic Sliding Door privacy lock; Integrated D-handles; Emergency release with red/green occupancy indicator; by Cavity Sliders USA Inc. www.CavitySliders.com.

- B. Pocket Door Pull:
 - 1. Basis-of-Design Product: Baden Pull (86184) Stainless Steel Baden Pull (S86002) by Emtek Products, Inc.; an Assa Abloy Group Company; www.emtek.com.
- C. Door stops: Provide stops to protect walls, casework or other hardware.
 - 1. Except as otherwise indicated, provide stops (wall, floor or overhead) at each leaf of every swinging door leaf.
 - 2. Where wall or floor stops are not appropriate, provide overhead holders.
- D. Weatherstrip and Gasket
 - 1. Provide continuous weather-strip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated or scheduled.
 - 2. Provide non-corrosive fasteners as recommended by the manufacturer for application indicated.
- E. Thresholds
 - 1. Except as otherwise indicated, provide standard metal threshold unit of type, size and profile as detailed or scheduled.
- F. Silencers
 - 1. Interior hollow metal frames, 3 for single doors, 2 for pairs of doors.
- G. Kickplates
 - 1. Four beveled edges, .050 inches minimum thickness, height and width as scheduled. Sheet-metal screws of bronze or stainless steel to match other hardware.

2.11 HARDWARE FINISHES

- A. Provide the following finishes unless noted differently in hardware groups:
 - 1. Hinges, exterior: 630 Stainless Steel Exterior.
 - 2. Hinges, interior: 626 Dull Chrome Interior.
 - 3. Locksets: 626 Dull Chrome.
 - 4. Exit Devices: 626 Dull Chrome.
 - 5. Closers: 689 Aluminum.
 - 6. Kickplates: 630 Stainless Steel.
 - 7. Other Hardware: 626 Dull Chrome.
 - 8. Thresholds: Clear Anodized Aluminum.
 - 9. Weatherstrip and Sweeps: Clear Anodized Aluminum.

2.12 KEYING REQUIREMENTS

- A. All keyed cylinders shall be subject to a new Best Master key system.
- B. Furnish cylinders with construction cores. Following construction, Owner to supply permanent keyed cores.
- C. Cylinders to be furnished with visual key control with key code. Stamped on the face of the keys and marked on the back or side of the cylinders.

D. Key Quantities

- 6 EA Master Keys
- 4 EA Control Keys
- 2 EA Construction Control Keys
- 10 EA Construction Keys
- 3 EA Change Keys per keyed alike group

PART 3 - EXECUTION

3.1 ACCEPTABLE INSTALLERS:

- A. Factory trained, certified, and carries a factory-issued card certifying that person as a "Certified Installer". Alternative: can demonstrate suitably equivalent competence and experience.

3.2 PREPARATION

- A. Ensure that walls and frames are square and plumb before hardware installation.
- B. Locate hardware per SDI-100 and applicable building, fire, life-safety, accessibility, and security codes. Notify Architect of any code conflicts before ordering materials.

3.3 INSTALLATION

- A. Do not install surface mounted items until finishes have been completed on substrate. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate for proper installation and operation.
- B. Locate floor stops not more than 4 inches from the wall.
- C. Drill pilot holes for fasteners in wood doors and/or frames.

3.4 ADJUSTING

- A. Adjust and check for proper operation and function. Replace units, which cannot be adjusted to operate freely and smoothly.
- B. Hardware damaged by improper installation or adjustment methods to be repaired or replaced to Owner's satisfaction.

3.5 FOLLOW UP INSPECTION

- A. Installer to provide letter of agreement to Owner that approximately 6 months after substantial completion, installer will visit project with representative of the manufacturers of the locking devices and door closers to accomplish the following:
 - 1. Re-adjust locks and closers
 - 2. Evaluate maintenance procedures and recommend changes or additions, and instruct Owner's personnel.
 - 3. Identify items that have deteriorated or failed.
 - 4. Submit written report identifying problems and likely future problems.

3.6 DEMONSTRATION

- A. Demonstrate electrical, electronic and pneumatic hardware system including adjustment and maintenance procedures

3.7 PROTECTION/CLEANING

- A. Cover installed hardware, protect from paint, cleaning agents, weathering, carts/barrows, etc. Remove covering materials and clean hardware just prior to substantial completion. Clean adjacent wall, frame and door surfaces soiled from installation/reinstallation process.

3.8 HARDWARE SCHEDULE

SET #01

3 Hinges	FB168 4 1/2 X 4 1/2	652	ST
1 Storeroom Lockset	QCL171 M LC	626	SH
1 Cylinder	1C Series STD	626	BE
1 Electric Strike	F41145	630	RC
1 Operator	ED 900 T FW2	689	DM
2 Auto Door Actuator	I-36 X ADA Blue "Push To Open"	CL	WI
1 Seal	S88 D (head & jambs)		PE
1 Kick Plate	K0050 10" x 2" LDW x B4E CSK	630	TR
1 Wall Bumper	1270WV	630	TR
1 Request to Exit	By security vendor		
1 Door Contact	By security vendor		
1 Card Reader	By security vendor		

SET #02

2 Elec. Continuous Hinge	661HD UL CE-58	AL	ST
1 Dustproof Strike	3911	630	TR
1 Set Auto Flush Bolts	3810 X 3810	630	TR
1 Electrified Lockset	QCL195-X M LC	626	SH
1 Cylinder	1C Series STD	626	BE
1 Electric Strike	F41145	630	RC
1 Coordinator	3094 Series x FB x Brackets		TR
1 Operator	ED 900 J8 FW2	689	DM
2 Auto Door Actuator	I-36 X ADA BLUE "Push To Open"	CL	WI
1 Door Closer	QDC111	689	SH
2 Door Stop	1209	630	TR
1 Seal	By Door Mfg.		
2 Door Bottom	315 CN		PE
1 Threshold	Per Detail		PE
2 Door Contacts	By security vendor		
1 Card Reader	By security vendor		

SET #03

2 Hinge	FBF179 4 1/2 X 4 1/2	652	ST
1 Elec Transfer Hinge	FBF179-58 4 1/2 x 4 1/2	652	ST
1 Electric Lockset	QCL195-X M LC	626	SH
1 Cylinder	1C Series STD	626	BE
1 Door Closer	QDC111	689	SH
1 Kick Plate	K0050 10" x 2" LDW x B4E CSK	630	TR
1 Wall Bumper	1270WV	630	TR
1 Seal	S88 D (head & jambs)		PE
1 Door Contact	By security vendor		
1 Card Reader	By security vendor		
1 Power Supplier	By security vendor		

SET #04

1 Continuous Hinge	661HD UL	AL	ST
1 Exit Device	QED211 x QET170 M	626	SH
1 Rim Cylinder	12E-72 STD	626	BE
1 Door Closer	QDC111	689	SH
1 Wall Bumper	1270WV	630	TR
1 Seal	By Storefront Supplier		
1 Door Bottom	315 CN		PE
1 Threshold	Per Detail		PE
1 Request to Exit	By security vendor		
1 Door Contacts	By security vendor		

SET #05

1 Continuous Hinge	661HD UL	AL	ST
1 Exit Device	QED211 x QET170 M	626	SH
1 Rim Cylinder	12E-72 STD	626	BE
1 Electric Strike	0161-05	630	RC
1 Door Closer	QDC111	689	SH
1 Wall Bumper	1270WV	630	TR
1 Seal	By Storefront Supplier		
1 Door Bottom	315 CN		PE
1 Threshold	Per Detail		PE
1 Request to Exit	By security vendor		
1 Door Contacts	By security vendor		
1 Card Reader	By security vendor		
1 Power Supplier	By security vendor		

SET #06

1 Continuous Hinge	661HD UL	AL	ST
1 Exit Device	QED211 x QET170 M	626	SH
1 Rim Cylinder	12E-72 STD	626	BE
1 Electric Strike	0161-05	630	RC
1 Operator	ED 900 J8 FW2	689	DM
2 Auto Door Actuator	I-36 X ADA BLUE "Push To Open"	CL	WI
1 Door Stop	As required	630	TR
1 Seal	By Storefront Supplier		
1 Door Bottom	Per Detail		PE
1 Threshold	Per Detail		PE
1 Request to Exit	By security vendor		
1 Door Contacts	By security vendor		
1 Card Reader	By security vendor		
1 Power Supplier	By security vendor		

SET #07

2 Hinges	FBF168 4 1/2 X 4 1/2 NRP	630	ST
1 Electric Hinge	CEFBF168-58 4 1/2 x 4 1/2	630	ST
1 Electric Lockset	QCL195-X M	626	SH
1 Cylinder	1C Series STD	626	BE
1 Electric Strike	F41145	630	RC
1 Operator	ED 900 J8 FW2	689	DM
2 Auto Door Actuator	I-36 X ADA BLUE "Push To Open"	CL	WI
1 Kick Plate	K0050 10" x 2" LDW x B4E CSK	630	TR
1 Wall Bumper	1270WV	630	TR
1 Seal	S88 D (head & jambs)		PE
1 Request to Exit	By security vendor		
1 Door Contacts	By security vendor		
1 Card Reader	By security vendor		

SET #08 – NOT USED

SET #09

3 Hinges	FBF168 4 1/2 X 4 1/2	652	ST
1 Storeroom Lockset	QCL171 M LC	626	SH
1 Cylinder	1C Series STD	626	BE
1 Electric Strike	F41145		RC
1 Operator	ED 900 J8 FW2	689	DM
1 Auto Door Actuator	I-36 X ADA BLUE "Push To Open"	CL	WI
1 Kick Plate	K0050 10" x 2" LDW x B4E CSK	630	TR
1 Wall Bumper	1270WV	630	TR
1 Seal	S88 D (head & jambs)		PE
1 Request to Exit	By security vendor		
1 Door Contacts	By security vendor		
1 Card Reader	By security vendor		

SET #09A

3 Hinges	FBF168 4 1/2 X 4 1/2	652	ST
1 Storeroom Lockset	QCL171 M LC	626	SH
1 Cylinder	1C Series STD	626	BE
1 Electric Strike	F41145		RC
1 Operator	ED 900 J8 FW2	689	DM
1 Auto Door Actuator	I-36 X ADA BLUE "Push To Open"	CL	WI
1 Kick Plate	K0050 10" x 2" LDW x B4E CSK	630	TR
1 Wall Bumper	1270WV	630	TR
1 Seal	S88 D (head & jambs)		PE
1 Request to Exit	By security vendor		
1 Door Contacts	By security vendor		
1 Card Reader	By security vendor		

SET #10

2 Hinges	FBF179 4 1/2 X 4 1/2	652	ST
1 Elec Transfer Hinge	FBF179-58 4 1/2 x 4 1/2	652	ST
1 Electric Lockset	QCL195-X M LC	626	SH
1 Cylinder	1C Series STD	626	BE
1 Wall Bumper	1270WV	630	TR
1 Coat Hook	3071-1	630	TR
1 Seal	S88 D (head & jambs)		PE
1 Door Contact	By security vendor		
1 Card Reader	By security vendor		
1 Power Supplier	By security vendor		

SET #11

1 Cylinder	As required	626	BE
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NOTE: Balance of Hardware by door manufacturer

SET #12

2 Hinges	FBF179 4 1/2 X 4 1/2	652	ST
1 Elec Transfer Hinge	FBF179-58 4 1/2 x 4 1/2	652	ST
1 Electric Lockset	QCL195-X M LC	626	SH
1 Cylinder	1C Series STD	626	BE
1 Wall Bumper	1270WV	630	TR
3 Door Silencers	1229A	GR	TR
1 Door Contact	By security vendor		
1 Card Reader	By security vendor		
1 Power Supplier	By security vendor		

SET #12A

3 Hinges	FBF199 4 1/2 X 4 1/2 NRP	630	ST
1 Exit Device	QED111 x QET170 M	626	SH
1 Rim Cylinder	12E-72 STD	626	BE
1 Electric Strike	9600 x 2005M3	630	HS
1 Door Closer	QDC111	689	SH
1 Door Stop	1211	630	TR
1 Seal	S88 D (head & jambs)		PE
1 Threshold	Per Detail		PE
1 Door Contact	By security vendor		
1 Card Reader	By security vendor		

SET #13

2 Hinges	FBF179 4 1/2 X 4 1/2	652	ST
1 Elec Transfer Hinge	FBF179-58 4 1/2 x 4 1/2	652	ST
1 Electric Lockset	QCL195-X M LC	626	SH
1 Cylinder	1C Series STD	626	BE
1 Door Closer	QDC111	689	SH
1 Wall Bumper	1270WV	630	TR
1 Kick Plate	K0050 10" x 2" LDW x B4E CSK	630	TR
1 Seal	S88 D (head & jambs)		PE
1 Door Contact	By security vendor		
1 Card Reader	By security vendor		
1 Power Supplier	By security vendor		

SET #14

3 Hinges	FBF168 4 1/2 X 4 1/2	652	ST
1 Storeroom Lockset	QCL171 M LC	626	SH
1 Cylinder	1C Series STD	626	BE
1 Electric Strike	F41145		RC
1 Operator	ED 900 T FW2	689	DM
1 Auto Door Actuator	I-36 X ADA BLUE "Push To Open"	CL	WI
1 Kick Plate	K0050 10" x 2" LDW x B4E CSK	630	TR
1 Mop Plate	KM050 6" x 1" LDW x B4E CSK	630	TR
1 Wall Bumper	1270WV	630	TR
1 Seal	S88 D (head & jambs)		PE
1 Door Bottom	234 AV 36"		PE
1 Threshold	151 A 36"		PE
1 Request to Exit	By security vendor		
1 Door Contact	By security vendor		
1 Card Reader	By security vendor		

SET #15

2 Hinges	FBF179 4 1/2 X 4 1/2 NRP	652	ST
1 Elec Transfer Hinge	FBF179-58 4 1/2 x 4 1/2	652	ST
1 Electric Lockset	QCL195-X M LC	626	SH
1 Cylinder	1C Series STD	626	BE
1 Door Closer	QDC111	689	SH
1 Kick Plate	K0050 10" x 2" LDW x B4E CSK	630	TR
1 Seal	S88 D (head & jambs)		PE
1 Door Contact	By security vendor		
1 Card Reader	By security vendor		
1 Power Supplier	By security vendor		

SET #16

3 Hinges	FBF179 4 1/2 X 4 1/2 NRP	652	ST
1 Elec Transfer Hinge	FBF179-58 4 1/2 x 4 1/2	652	ST
1 Electric Lockset	QCL195-X M LC	626	SH
1 Cylinder	1C Series STD	626	BE
1 Door Closer	QDC111	689	SH
1 Door Stop	1270WV or 1211 (as required)	630	TR
1 Seal	S88 D (head & jambs)		PE
1 Door Bottom	234 AV		PE
1 Threshold	151 A		PE
1 Door Contacts	By security vendor		
1 Card Reader	By security vendor		
1 Power Supplier	By security vendor		

SET #17

2 Hinges	FBF179 4 1/2 X 4 1/2	652	ST
1 Elec Transfer Hinge	FBF179-58 4 1/2 x 4 1/2	652	ST
1 Electric Lockset	QCL195-X M LC	626	SH
1 Cylinder	1C Series STD	626	BE
1 Wall Bumper	1270WV	630	TR
3 Door Silencers	1229A	GR	TR
1 Door Contacts	By security vendor		
1 Card Reader	By security vendor		
1 Power Supplier	By security vendor		

SET #18

3 Hinges	FBF191 4 1/2 X 4 1/2	630	ST
1 Privacy w/Occupancy Ind.	QCI285 M	626	SH
1 Kick Plate	K0050 10" x 2" LDW x B4E CSK	630	TR
1 Mop Plate	KM050 6" x 1" LDW x B4E CSK	630	TR
1 Wall Bumper	1270WV	630	TR
1 Seal (sound dampening)	S88 D (head & jambs)		PE

SET #19

3 Hinges	FBF191 4 1/2 X 4 1/2	630	ST
1 Privacy w/Occupancy Ind.	QCI285 M	626	SH
1 Door Closer	QDC111	689	SH
1 Kick Plate	K0050 10" x 2" LDW x B4E CSK	630	TR
1 Mop Plate	KM050 6" x 1" LDW x B4E CSK	630	TR
1 Wall Bumper	1270WV	630	TR
1 Seal	S88 D (head & jambs)		PE

SET #20 - NOT USED

SET #21

3 Hinges	FBF191 4 1/2 X 4 1/2 NRP	630	ST
1 Storeroom Lockset	QCL171 M LC	626	SH
1 Cylinder	1C Series STD	626	BE
1 Door Closer	QDC111	689	SH
1 Kick Plate	K0050 10" x 2" LDW x B4E CSK	630	TR
1 Wall Bumper	1270WV	630	TR
1 Seal	S88 D (head & jambs)		PE
1 Door Bottom	315 CN		PE
1 Threshold	Per Detail		PE
1 Raindrip	346C 4"ODW		PE

SET #22 - NOT USED

SET #23

3 Hinges	FBF179 4 1/2 X 4 1/2	652	ST
1 Storeroom Lockset	QCL171 M LC	626	SH
1 Cylinder	1C Series STD	626	BE
1 Door Closer	QDC111	689	SH
1 Kick Plate	K0050 10" x 2" LDW x B4E CSK	630	TR
1 Wall Bumper	1270WV	630	TR
1 Seal	S88 D (head & jambs)		PE
1 Door Contacts	By security vendor		

SET #23A

2 Hinges	FBF179 4 1/2 X 4 1/2	652	ST
1 Elec Transfer Hinge	FBF179-58 4 1/2 x 4 1/2	652	ST
1 Electric Lockset	QCL195-X M LC	626	SH
1 Cylinder	1C Series STD	626	BE
1 Door Closer	QDC111	689	SH
1 Kick Plate	K0050 10" x 2" LDW x B4E CSK	630	TR
1 Wall Bumper	1270WV	630	TR
1 Seal	S88 D (head & jambs)		PE
1 Door Contact	By security vendor		
1 Card Reader	By security vendor		
1 Power Supplier	By security vendor		

SET #24

1 Continuous Hinge	661HD UL	AL	ST
1 Storeroom Lockset	QCL 171 M LC	626	SH
1 Cylinder	1C Series STD	626	BE
1 Electric Strike	F41145	630	RC
1 Operator	ED 900 T FW2	689	DM
2 Auto Door Actuator	I-36 X ADA BLUE "PUSH TO OPEN"	CL	WI
1 Wall Bumper	1270WV	630	TR
1 Seal	By Door Mfg.		
1 Door Bottom	315 CN		PE
1 Threshold	Per Detail		PE
1 Request to Exit	By security vendor		
1 Door Contacts	By security vendor		
1 Card Reader	By security vendor		

SET #25

1 Continuous Hinge	661HD UL	AL	ST
1 Exit Device	QED211 x QET170 M	626	SH
1 Rim Cylinder	12E-72 STD	626	BE
1 Electric Strike	0161-05	630	RC
1 Door Closer	QDC111	689	SH
1 Door Stop	As required	630	TR
1 Seal	By Storefront Supplier		
1 Door Bottom	315 CN		PE
1 Threshold	Per Detail		PE
1 Door Contact	By security vendor		
1 Request to Exit	By security vendor		
1 Card Reader	By security vendor		

SET #26

3 Hinges	FBF168 4 1/2 X 4 1/2	652	ST
1 Exit Device	QED113 x QET130 M	626	SH
1 Door Closer	QDC111	689	SH
1 Kick Plate	K0050 10" x 2" LDW x B4E CSK	630	TR
1 Wall Bumper	1270WV	630	TR
1 Seal	S88 D (head & jambs)		PE

SET #27

3 Hinges	FBF191 4 1/2 X 4 1/2 NRP	630	ST
1 Storeroom Lockset	QCL171 M LC	626	SH
1 Cylinder	1C Series STD	626	BE
1 Door Closer	QDC111	689	SH
1 Door Stop	1209	630	TR
1 Seal	S88 D (head & jambs)		PE
1 Raindrip	346C 4"ODW		PE
1 Door Bottom	315 CN		PE
1 Threshold	Per Detail		PE

SET #28

1 Continuous Hinge	661HD UL CE-58	AL	ST
1 Electrified Lockset	QCL195-X M LC	626	SH
1 Cylinder	1C Series STD	626	BE
1 Electric Strike	As required	630	
1 Operator	ED 900 J8/T FW2	689	DM
2 Auto Door Actuator	I-36 X ADA BLUE "PUSH TO OPEN"	CL	WI
1 Kick Plate	K0050 10" x 2" LDW x B4E CSK	630	TR
1 Door Stop	1209	630	TR
1 Seal	By Door Mfg.		
1 Door Bottom	315 CN		PE
1 Threshold	Per Detail		PE
1 Door Contacts	By security vendor		
1 Card Reader	By security vendor		

SET #29

5 Hinge	FBF191 4 1/2 X 4 1/2	630	ST
1 Elec Transfer Hinge	FBF191-58 4 1/2 x 4 1/2	630	ST
1 Dustproof Strike	3911	630	TR
1 Set Semi-Auto Flush Bolts	3825L X 3815L	630	TR
1 Electric Lockset	QCL195-X M FS4 LC	626	SH
1 Cylinder	1C Series STD	626	BE
1 Coordinator	3094 Series x FB		TR
2 Door Closer	QDC111 REG	689	SH
2 Kick Plate	K0050 10" x 2" LDW x B4E CSK	630	TR
1 Wall Bumper	1270WV	630	TR
1 Astragal	357SS x S88D (push side inactive leaf)		PE
1 Seal	S88 D (head & jambs)		PE
2 Door Bottom	315 CN		PE
1 Threshold	Per Detail		PE
2 Door Contact	By security vendor		
1 Card Reader	By security vendor		
1 Power Supplier	By security vendor		

SET #30

2 Hinges	FBF179 4 1/2 X 4 1/2	652	ST
1 Elec Transfer Hinge	FBF179-58 4 1/2 x 4 1/2	652	ST
1 Electric Lockset	QCL195-X M LC	626	SH
1 Cylinder	1C Series STD	626	BE
1 Closer	QDC111	689	SH
1 Kick Plate	K0050 10" x 2" LDW x B4E CSK	630	TR
1 Wall Bumper	1270WV	630	TR
1 Seal	S88 D (head & jambs)		PE
1 Door Contact	By security vendor		
1 Card Reader	By security vendor		
1 Power Supplier	By security vendor		

SET #31

3 Hinges	FBF179 4 1/2 X 4 1/2	652	ST
1 Storeroom Lockset	QCL171 M LC	626	SH
1 Cylinder	1C Series STD	626	BE
1 Electric Strike	F41145	630	RC
1 Operator	ED 900 T FW2	689	DM
2 Auto Door Actuator	I-36 X ADA BLUE "Push To Open"	CL	WI
1 Kick Plate	K0050 10" x 2" LDW x B4E CSK	630	TR
1 Wall Bumper	1270WV	630	TR
1 Seal	S88 D (head & jambs)		PE
1 Door Contacts	By security vendor		

SET #32

3 Hinges	FBF168 4 1/2 X 4 1/2	652	ST
1 Storeroom Lockset	QCL171 M LC	626	SH
1 Cylinder	1C Series STD	626	BE
1 Electric Strike	F41145		RC
1 Operator	ED 900 T FW2	689	DM
1 Auto Door Actuator	I-36 X ADA BLUE "Push To Open"	CL	WI
1 Kick Plate	K0050 10" x 2" LDW x B4E CSK	630	TR
1 Wall Bumper	1270WV	630	TR
1 Seal	S88 D (head & jambs)		PE
1 Door Bottom	234 AV		PE
1 Threshold	151 A		PE
1 Door Contact	By security vendor		
1 Card Reader	By security vendor		
1 Power Supplier	By security vendor		

SET #33

3 Hinges	FBF168 4 1/2 X 4 1/2 NRP	652	ST
1 Exit Device	QED113 x QET170 M	626	SH
1 Rim Cylinder	12E-72 STD	626	BE
1 Electric Strike	0161-05	630	RC
1 Operator	ED 900 T FW2	689	DM
1 Auto Door Actuator	I-36 X ADA BLUE "Push To Open"	CL	WI
1 Kick Plate	K0050 10" x 2" LDW x B4E CSK	630	TR
1 Wall Bumper	1270WV	630	TR
1 Seal	S88 D (head & jambs)		PE
1 Door Contact	By security vendor		
1 Card Reader	By security vendor		
1 Power Supplier	By security vendor		

SET #33A

3 Hinges	FBF168 4 1/2 X 4 1/2 NRP	652	ST
1 Exit Device	QED113 x QET170 M	626	SH
1 Rim Cylinder	12E-72 STD	626	BE
1 Electric Strike	0161-05	630	RC
1 Closer	QDC111 REG	689	DM
1 Wall Bumper	1270WV	630	TR
1 Seal	S88 D (head & jambs)		PE
1 Door Contact	By security vendor		
1 Card Reader	By security vendor		
1 Power Supplier	By security vendor		

SET #34

3 Hinges	FBF168 4 1/2 X 4 1/2	652	ST
1 Storeroom Lockset	QCL171 M LC	626	SH
1 Cylinder	1C Series STD	626	BE
1 Electric Strike	F41145		RC
1 Operator	ED 900 T FW2	689	DM
1 Auto Door Actuator	I-36 X ADA BLUE "Push To Open"	CL	WI
1 Kick Plate	K0050 10" x 2" LDW x B4E CSK	630	TR
1 Wall Bumper	1270WV	630	TR
1 Seal	S88 D (head & jambs)		PE
1 Door Contact	By security vendor		
1 Card Reader	By security vendor		
1 Power Supplier	By security vendor		

SET #35

2 Hinges	FBF179 4 1/2 X 4 1/2	652	ST
1 Elec Transfer Hinge	FBF179-58 4 1/2 x 4 1/2	652	ST
1 Electric Lockset	QCL195-X M LC	626	SH
1 Cylinder	1C Series STD	626	BE
1 Door Closer	QDC111	689	SH
1 Kick Plate	K0050 10" x 2" LDW x B4E CSK	630	TR
1 Wall Bumper	1270WV	630	TR
1 Seal	S88 D (head & jambs)		PE
1 Door Contact	By security vendor		
1 Card Reader	By security vendor		
1 Power Supplier	By security vendor		

SET #36

6 Hinges	FBF179 4 1/2 X 4 1/2	630	ST
1 Dustproof Strike	3911	630	TR
1 Set Semi-Auto Flush Bolts	3825L X 3815L	630	TR
1 Storeroom Lockset	QCL171 M LC FS4	626	SH
1 Cylinder	1C Series STD	626	BE
1 Coordinator	3094 Series x FB	BL	TR
1 Door Closer	QDC111	689	SH
2 Kick Plate	K0050 10" x 2" LDW x B4E CSK	630	TR
1 Wall Bumper	1270WV	630	TR
1 Astragal	357SS x S88D		PE
1 Seal	S88 D (head & jambs)		PE
1 Threshold	Per Detail		PE

SET #37

3 Hinges	FBF199 4 1/2 X 4 1/2 NRP	630	ST
1 Exit Device	QED111 x QET170 M	626	SH
1 Rim Cylinder	12E-72 STD	626	BE
1 Electric Strike	9600 x 2005M3	630	HS
1 Door Closer	QDC111	689	SH
1 Door Stop	1209	630	TR
1 Seal	S88 D (head & jambs)		PE
1 Raindrip	346C 4"ODW		PE
1 Door Bottom	315 CN		PE
1 Threshold	Per Detail		PE
1 Request to Exit	By security vendor		
1 Door Contact	By security vendor		
1 Card Reader	By security vendor		

SET #38

2 Hinges	FBF168 4 1/2 X 4 1/2 NRP	630	ST
1 Electric Hinge	CEFBF168-58 4 1/2 x 4 1/2	630	ST
1 Elect Lockset (Fail-Safe)	QCL193-X M LC	626	SH
1 Cylinder	1C Series STD	626	BE
1 Door Closer	QDC111	689	SH
1 Kick Plate	K0050 10" x 2" LDW x B4E CSK	630	TR
1 Wall Bumper	1270WV	630	TR
1 Seal	S88 D (head & jambs)		PE
1 Door Contacts	By security vendor		
1 Card Reader	By security vendor		
1 Power Supplier	By security vendor		

NOTE: Integrate fail-safe device into fire alarm.

SET #39

5 Hinges	FBF191 4 1/2 X 4 1/2 NRP	630	ST
1 Elect Transfer Hinge	FBF191-58 4 1/2 x 4 1/2	630	ST
1 Dustproof Strike	3911	630	TR
1 Set Semi-Auto Flush Bolts	3810 X 3810	630	TR
1 Electrified Lockset	QCL195-X M LC 478S-7/8" LTC	626	SH
1 Cylinder	1C Series STD	626	BE
1 Coordinator	3094 Series x FB x Brackets		TR
2 Door Closer	QDC119	689	SH
1 Raindrip	346C 4"ODW		PE
1 Astragal	357SS x S88D		PE
1 Seal	S88 D (head & jambs)		PE
2 Door Bottom	315 CN		PE
1 Threshold	Per Detail		PE
2 Door Contacts	By security vendor		
1 Card Reader	By security vendor		
1 Power Supplier	By security vendor		

SET #40

6 Hinges	FBF199 4 1/2 X 4 1/2	630	ST
1 Dustproof Strike	3911	630	TR
1 Set Semi-Auto Flush Bolts	3825L X 3815L	630	TR
1 Storeroom Lockset	QCL171 M LC	626	SH
1 Cylinder	1C Series STD	626	BE
1 Coordinator	3094 Series x FB x Brackets		TR
2 Door Closer	QDC119	689	SH
2 Kick Plate	K0050 10" x 2" LDW x B4E CSK	630	TR
1 Astragal	357SS x S88D		PE
1 Seal	S88 D (head & jambs)		PE
2 Door Bottom	315 CN		PE
1 Threshold	Per Detail		PE

SET #41

2 Hinges	FBF168 4 1/2 X 4 1/2 NRP	630	ST
1 Electric Hinge	CEFBF168-58 4 1/2 x 4 1/2	630	ST
1 Exit Device	E2103 X E4908D FAIL SAFE	626	PR
1 Cylinder	12E-72 STD	626	BE
1 Door Closer	QDC111	689	SH
1 Kick Plate	K0050 10" x 2" LDW x B4E CSK	630	TR
1 Wall Bumper	1270WV	630	TR
1 Seal	S88 D (head & jambs)		PE
1 Request to Exit	By security vendor		
1 Door Contacts	By security vendor		
1 Card Reader	By security vendor		
1 Power Supply	By security vendor		

NOTE: Integrate fail-safe device into fire alarm.

UNITS

SET #U-1 - Unit Entry/Exterior

3 Hinges	FBF191 4 1/2 X 4 1/2 NRP	630	ST
1 Lockset	QCI231 M	626	SH
1 Cylinder	1C Series STD	626	BE
1 Door Closer	QDC311 F	689	SH
1 Kick Plate	K0050 10" x 2" LDW x B4E CSK	630	TR
1 Wall Bumper	1270WV	630	TR
1 Door Viewer	976U	625	TR
1 Seal	S88 D (head & jambs)		PE
1 Door Bottom	Per Detail		PE
1 Threshold	Per Detail		PE
1 Raindrip	346C 4"ODW (as required)		PE

SET #U-2 - Bed/Bath

3 Hinges	F179	652	ST
1 Privacy Set	QGT240 T	626	SY
1 Wall Bumper Hinge Pin Stop	1270WV 1240 as Required	630 626	TR
3 Door Silencers	By Frame Mfg.		

SET #U-3 - Closet Pair

6 Hinges	F179	652	ST
2 Roller Latch	1559	626	TR
2 Dummy Trim	QGT220 T	626	SY
2 Hinge Pin Stop	1240	626	TR
2 Door Silencers	By Frame Mfg.		

SET #U-4 - Closet/Sgl

3 Hinges	F179	652	ST
1 Passage Set	QGT230 T	626	SY
1 Wall Bumper Hinge Pin Stop	1270WV 1240 as Required	630 626	TR
2 Door Silencers	By Frame Mfg.		

SET #U-5 - Deck/patio

3 Hinges	F179	652	ST
1 Deadlock	QGD281	626	SY
1 Passage Set	QCL130 M	626	SH
1 Wall Bumper	1270WV	630	TR
1 Seal	S88 D (head & jambs)		PE
1 Door Bottom	Per Detail		PE
1 Threshold	Per Detail		PE

SET #U-6 – Not Used

SET #U-7 - Unit Entry Interior

3 Hinges	FBF179 4 1/2 X 4 1/2	652	ST
1 Lockset	QCI231 M LC 478S	626	SH
1 Cylinder	1C Series STD	626	BE
1 Door Closer	QDC311 F	689	SH
1 Kick Plate	K0050 10" x 2" LDW x B4E CSK	630	TR
1 Seal	S88 D (head & jambs)		PE
1 Door Bottom	234 AV		PE
1 Threshold	Per Detail		PE
1 Door Viewer	976U	625	TR

END OF SECTION

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SECTION 08 80 00 - GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Glass for interior doors and interior borrowed lites.
 - 2. Glass for exterior windows, doors, and storefront and entrances.
 - 3. Mirror glass.
 - 4. Glazing sealants and accessories.
- B. Related Requirements:
 - 1. Section 08 11 13 "Hollow Metal Door and Frames".
 - 2. Section 08 14 16 "Flush Wood Doors".
 - 3. Section 08 41 13 "Aluminum-Framed Entrances and Storefronts".
 - 4. Section 08 44 13 "Glazed Aluminum Curtain Walls".
 - 5. Section 08 53 13 "Vinyl Windows".

1.3 DEFINITIONS

- A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.
- C. IBC: International Building Code.
- D. Interspace: Space between lites of an insulating-glass unit.

1.4 COORDINATION

- A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.5 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 temporary protection requirements for glazing during and after installation.

1.6 SUBMITTALS

- A. Product Data: For each type of product.
- B. Glass Samples: For each type of glass product other than clear monolithic vision glass; 12 inches square.

- C. Glazing Accessory Samples: For sealants and colored spacers, in 12-inch lengths. Install sealant Samples between two strips of material representative in color of the adjoining framing system.
- D. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.
- E. Qualification Data: For Installer manufacturers of insulating-glass units with sputter-coated, low-E coatings.
- F. Product Certificates: For glass.
- G. Preconstruction adhesion and compatibility test report.
- H. Sample Warranties: For special warranties.

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 and certified 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. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.
- D. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

1.8 PRECONSTRUCTION TESTING

- A. Preconstruction Adhesion and Compatibility Testing: Test each glass product, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.
 - 1. Testing is not required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.
 - 2. Use ASTM C 1087 to determine whether priming and other specific joint-preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.
 - 3. Test no fewer than eight Samples of each type of material, including joint substrates, shims, sealant backings, secondary seals, and miscellaneous materials.
 - 4. Schedule enough time for testing and analyzing results to prevent delaying the Work.
 - 5. For materials failing tests, submit sealant manufacturer's written instructions for corrective measures including the use of specially formulated primers.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- B. Comply with insulating-glass manufacturer's written instructions for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.10 FIELD CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or are below 40 deg F.

1.11 WARRANTY

- A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.
1. Warranty Period: Ten (10) years from date of Substantial Completion.
- B. Manufacturer's Special Warranty for 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: Ten (10) years from date of Substantial Completion.
- C. Manufacturer's Special Warranty for Insulating Glass: Manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.
1. Warranty Period: Ten (10) years from date of Substantial Completion.
- D. Manufacturer's Special Warranty for Intrusion-Resistant Glass Products: 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: Ten (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. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined according to the IBC and ASTM E 1300.
1. Thickness of Patterned Glass: Base design of patterned glass on thickness at thinnest part of the glass.

2. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch, whichever is less.
3. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.
- C. Safety Glazing: Where safety glazing is indicated or required by code, provide glazing that complies with 16 CFR 1201, Category II.
- D. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
 1. For monolithic-glass lites, properties are based on units with lites 6 mm thick.
 2. For laminated-glass lites, properties are based on products of construction indicated.
 3. 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.
 4. 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.
 5. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.2 MANUFACTURERS

- A. Source Limitations for Glass: Obtain from single source from single manufacturer for each glass type.
- B. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.
- C. Basis-of-Design Manufacturer: Vitro Architectural Glass; www.vitroglazings.com.
- D. Other Approved Manufacturers:
 1. AGC Glass North America; www.agcglass.com.
 2. Oldcastle Building Envelope; www.obe.com.
 3. Pilkington, a div. of Nippon Sheet Glass Co., Ltd; www.pilkington.com.

2.3 GLASS PRODUCTS, GENERAL

- A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.
 1. GANA Publications: "Laminated Glazing Reference Manual" and "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."
- B. Safety Glazing Labeling: Where safety glazing is provided, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- C. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.

- D. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than the thickness indicated.
 - 1. Minimum Glass Thickness for Exterior Lites: 6 mm.
 - 2. Thickness of Tinted Glass: Provide same thickness for each tint color indicated throughout Project.
- E. Strength: Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where fully tempered float glass is indicated, provide fully tempered float glass.

2.4 GLASS PRODUCTS

- A. Clear Annealed Float Glass: ASTM C 1036, Type I, Class 1 (clear), Quality-Q3.
- B. Fully Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
 - 1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
- C. Heat-Strengthened Float Glass: ASTM C 1048, Kind HS (heat strengthened), Type I, Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
 - 1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
- D. Ceramic-Coated Vision Glass: ASTM C 1048, Condition C, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3; and complying with Specification No. 95-1-31 in GANA's "Engineering Standards Manual."
 - 1. Basis-of-Design Product: Digital Ceramic Frit Glass by Hartung Glass Industries; www.hartung.com.
- E. Printed Vision Glass: ASTM C 1048, Condition C, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3; and complying with Specification No. 95-1-31 in GANA's "Engineering Standards Manual."
 - 1. Basis-of-Design Product: High Definition Glass (HDG), 720 DPI Digitally Printed Glass by Hartung Glass Industries; www.hartung.com.
- F. Silicone-Coated Spandrel Glass: ASTM C 1048, Type I, Condition C, Quality-Q3.
 - 1. Basis-of-Design Product: Opaci-Coat 300 by ICD High Performance Coatings; www.icdcoatings.com.
- G. Interspace Content: Where indicated to provide argon-filled interspace, provide the Insulating Glass Manufacturers Association of Canada (IGMAC) accepted standard argon gas fill level of 90 percent argon and 10 percent dry air.
- H. Edge Treatment at Monolithic and Laminated Glazing: Where monolithic or laminated glazing is indicated and edges are exposed to view, provide glazing with polished edges and the following edge treatments:
 - 1. At Structural Sealant Butt Joints: Provide flat ground smooth edges.
 - 2. At Exposed Edges: Provide flat polished edges with beveled edges and corners, 1/8 inch (3 mm) at outer edges and corners.

2.5 LAMINATED GLASS

- A. Laminated Glass: meeting requirements of ASTM C1172 "Standard Specification for Laminated Architectural Flat Glass". 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 (PVB) interlayer ionomeric polymer interlayer cast-in-place and cured-transparent-resin interlayer to comply with interlayer manufacturer's written instructions.
 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. Basis-of-Design Product, Clear: SentryGlas by E.I. DuPont DeNemours & Co., Inc.; www.dupont.com.

2.6 INSULATING GLASS

- A. Insulating Glass Units (IGU): Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E2190.
1. Perimeter Spacer: Manufacturer's standard spacer material and construction Aluminum with black, color anodic finish.
 2. Desiccant: Molecular sieve or silica gel, or a blend of both.
 3. Basis-of-Design Manufacturer: Cardinal Glass Industries, Inc; www.cardinalcorp.com.
 1. Other Approved Manufacturer: Vitro Architectural Glass; www.vitroglazings.com.

2.7 GLAZING TYPES

- A. Glazing Type IG-C1 and ISG-C1: Exterior clear IGU, general use and at safety glazing.
1. Overall Unit Thickness: 1 inch (25.4 mm).
 - a. Outer Lite: 1/4 inch (6 mm) clear float glass, with low-e coating on no. 2 surface.
 - 1) Low-E Coating Basis-of-Design Product: Solarban 70XL by Vitro Architectural Glass.
 - b. Interspace Content: Air.
 - c. Inner Lite: Fully tempered 1/4 inch (6 mm) clear float glass.
 - d. Edge Spacer: Black; warm-edge.
 2. Performance Requirements:
 - a. Winter Nighttime U-Factor: 0.28 Btu/(hr x sqft x °F).
 - b. Solar Heat Gain Coefficient (SHGC): 0.27 maximum.
 - c. Visual Light Transmittance (VLT): 64 percent.
 3. Provide safety glazing where required (ISG-C1).
- B. Glazing Type G-2: Structural, monolithic interior single lites.
1. Fully tempered 1/4 inch (6 mm) clear float glass.
 2. Provide safety glazing where required.

- C. Glazing Type, MR 1: Mirrored, monolithic interior single lites.
 - 1. Mirror Glass: Fully tempered; 1/4-inch (6-mm) minimum thick.
 - a. Mount in j-channels at perimeter where indicated.
 - b. Sizes as indicated. Field verify openings in tile and other construction where inseting mirrors, with edge clearances indicated. Mirrors are subject to rejection where dimensional clearances indicated are not maintained.
 - 2. Select materials and/or provide supports as required to limit mirrored glass deflection to 1/200 or flexure limit of glass with full recovery of glazing materials, whichever is less.
 - 3. Edge polished where exposed.
 - 4. Edge seal all mirrors.

2.8 GLAZING SEALANTS

- A. General:
 - 1. Compatibility: Compatible with one another and with other materials they contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
 - 2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
 - 3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.
- B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.

2.9 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.

2.10 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, with requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

- C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

2.11 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.
 - 1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
 - a. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces Insert temperature change.
- 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.

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 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. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.
- C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- F. Provide spacers for glass lites where length plus width is larger than 50 inches.
 - 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.
- G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- I. Set glass lites with proper orientation so that coatings face exterior or interior as specified.
- J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Cover vertical framing joints by applying tapes to heads and sills first, then to jambs. Cover horizontal framing joints by applying tapes to jambs, then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Do not remove release paper from tape until right before each glazing unit is installed.
- F. Apply heel bead of elastomeric sealant.
- G. Center glass lites in openings on setting blocks, and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
- H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 GASKET GLAZING (DRY)

- A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- E. Install gaskets so they protrude past face of glazing stops.

3.6 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. Immediately after installation remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.
 - 1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.
- C. Remove and replace glass that is damaged during construction period.
- D. Wash glass on both exposed surfaces 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

SECTION 08 91 00 - LOUVERS

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. Fixed, extruded-aluminum louvers.
 - 2. Delegated design.
- B. Related Requirements:
 - 1. Section 01 61 16 "Delegated Design Requirements".
 - 2. Section 07 25 00 "Weather Barriers" for weather sealants in air-barrier penetrations.
 - 3. Section 07 62 00 "Sheet Metal Flashing and Trim" for metal trim profiles.
 - 4. Section 07 92 00 "Joint Sealants" for perimeter sealant.

1.3 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. Vertical Louver: Louver with vertical blades (i.e., the axes of the blades are vertical).
- D. 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.
- E. Wind-Driven-Rain-Resistant Louver: Louver that provides specified wind-driven rain performance, as determined by testing according to AMCA 500-L.

1.4 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. Samples: For each type of metal finish required; 2 by 3 inches minimum on same material as louver construction.
- C. 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.
- 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.

- E. 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.
- F. Qualification Data: For professional engineer.

1.5 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
 - 2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."
 - 3. AWS D1.6/D1.6M, "Structural Welding Code - Stainless 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.
- B. Acceptable Manufacturers:
 - 1. United Enertech; www.unitedenertech.com.
 - 2. Airolite Company, LLC; www.airolite.com.
 - 3. Construction Specialties, Inc.; www.c-sgroup.com.
 - 4. Greenheck Fan Corp.; www.greenheck.com.
 - 5. Ruskin Co.; www.ruskin.com.

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 61 16 "Delegated Design Requirements," to design louvers.
- 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 pressures as indicated on Drawings.
 - 2. Other Design Loads: As indicated on Drawings.
- C. 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: Refer to Drawings.
 - 2. Component Importance Factor: 1.0.

- D. 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.
- E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
 - 1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- F. SMACNA Standard: Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.

2.3 FIXED, EXTRUDED-ALUMINUM LOUVERS

- A. Basis-of-Design Product: Model. no. XSD-130 Wind-Driven Rain Louver by United Enertech.
- B. Horizontal, Storm-Resistant, Drainable-Blade Louver:
 - 1. Louver Depth: 5 inches.
 - 2. Frame and Blade Nominal Thickness: As required to comply with structural performance requirements, but not less than 0.060 inches (1.5 mm) for blades and 0.080 inches (2.0 mm) for frames.
 - 3. Mullion Type: Exposed.
 - 4. AMCA Seal: Mark units with AMCA Certified Ratings Seal.
 - 5. Finish: Kynar 500.
 - 6. Color: As selected by Architect from manufacturer's full range.

2.4 LOUVER SCREENS

- A. General: Provide screen at each exterior louver.
 - 1. Screen Location for Fixed Louvers: Interior face.
 - 2. Screening Type: Bird screening except where insect screening is indicated.
- B. Louver Screen Frames: Fabricate with mitered corners to louver sizes indicated.

2.5 BLANK-OFF PANELS

- A. General: Provide blank-off panels where required or indicated, of type required. Finished to match louver.
- B. Uninsulated, Blank-Off Panels: Metal sheet attached to back of louver.
- C. Insulated, Blank-Off Panels: Laminated panels consisting of an insulating core surfaced on back and front with metal sheets and attached to back of louver.

2.6 LOUVER SCREENS

- A. General: Provide screen at louvers indicated.
 - 1. Screen Location for Fixed Louvers: Interior face.
 - 2. Screening Type: Bird screening, unless otherwise indicated; insect screening where indicated.
- B. Secure screens to louver frames with stainless-steel machine screws, spaced a maximum of 6 inches (150 mm) from each corner and at 12 inches (300 mm) o.c.

- C. Louver Screen Frames: Fabricate with mitered corners to louver sizes indicated.
 - 1. Metal: Same kind and form of metal as indicated for louver to which screens are attached. Reinforce extruded-aluminum screen frames at corners with clips.
 - 2. Finish: Same finish as louver frames to which louver screens are attached.
 - 3. Type: Rewirable frames with a driven spline or insert for [securing screen mesh.
- D. Louver Screening for Aluminum Louvers:
 - 1. Insect Screening: Stainless steel, 1/16 by 1/16 inch (1.4-by-1.4-mm) mesh, 0.009-inch (0.23-mm) wire.
 - 2. Edge Treatment: Trim perimeter edges of blank-off panels with louver manufacturer's standard extruded-aluminum-channel frames, not less than 0.079-inch (2.0-mm) nominal thickness, with corners mitered and with same finish as panels.

2.7 MATERIALS

- A. Aluminum Extrusions: ASTM B 221M, alloy 6063-T5 or T-52.
- B. Aluminum Sheet: ASTM B 209M, alloy 3003 or 5005 with temper as required for forming, or as otherwise recommended by metal producer for required finish.
- C. Aluminum Castings: ASTM B 26/B 26M, alloy 319.
- D. Galvanized Steel Sheet: ASTM A 653/A 653M, Z275 zinc coating, mill phosphatized.
- E. Fasteners: Of same basic metal and alloy as fastened metal or 300 Series stainless steel, unless otherwise indicated. Do not use metals that are incompatible with joined materials.
 - 1. Use types and sizes to suit unit installation conditions.
 - 2. Use hex-head or Phillips pan-head screws for exposed fasteners, unless otherwise indicated.
- F. Postinstalled Fasteners for Concrete and 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 per ASTM E 488, conducted by a qualified independent testing agency.
- G. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.8 FABRICATION, GENERAL

- A. Assemble louvers in factory 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.
 - 2. Horizontal Mullions: Provide horizontal mullions at joints where 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.

- E. Include supports, anchorages, and accessories required for complete assembly.
- F. Provide vertical mullions of type and at spacings indicated, but not more than recommended by manufacturer, or 72 inches (1830 mm) o.c., whichever is less.
 - 1. Fully Recessed Mullions: Where indicated, provide mullions fully recessed behind louver blades. Where length of louver exceeds fabrication and handling limitations, fabricate with close-fitting blade splices designed to permit expansion and contraction.
 - 2. Exposed Mullions: Where indicated, provide units with exposed mullions of same width and depth as louver frame. Where length of louver exceeds fabrication and handling limitations, provide interlocking split mullions designed to permit expansion and contraction.
 - 3. Exterior Corners: Prefabricated corner units with mitered blades with concealed close-fitting splices and with semirecessed mullions at corners.
- G. 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.

2.9 FINISHES, GENERAL

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

2.10 ALUMINUM FINISHES

- A. Finish designations prefixed by AA comply with system established by the Aluminum Association for designating aluminum finishes.
- B. Fluoropolymer Finish: For panels and accessories indicated to have fluoropolymer finish:
 - 1. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent polyvinylidene difluoride (PVDF) resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - a. Basis-of-Design Products:
 - 1) Hylar by Solvay; www.solvay.com.
 - 2) Kynar by Arkema: www.kynar.com.

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.
- 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 and vents 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. Repair finishes damaged by cutting, welding, soldering, and grinding. Restore finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory, make required alterations, and refinish entire unit or provide new units.
- F. Protect galvanized and nonferrous-metal surfaces from corrosion or galvanic action by applying a heavy coating of bituminous paint on surfaces that will be in contact with concrete, masonry, or dissimilar metals.
- G. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Section 07 92 00 "Joint Sealants" for sealants applied during louver installation.

3.4 ADJUSTING AND CLEANING

- A. Test operation of adjustable louvers and adjust as needed to produce fully functioning units that comply with requirements.
- B. Clean exposed surfaces of louvers and vents that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate until final cleaning.
- C. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.
- D. Restore louvers and vents 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

SECTION 09 22 16 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Non-load-bearing steel framing systems for interior partitions.
 - 2. Suspension systems for interior gypsum ceilings and soffits.
- B. Related Requirements:
 - 1. Section 06 10 00 "Rough Carpentry" for fire retardant-treated wood blocking and plywood backing.

1.3 COORDINATION

- A. Coordinate opening requirements with Division 08 "Openings" Sections.
- B. Coordinate items requiring blocking and for additional support including, but not limited to the following:
 - 1. Casework and cabinets in Section 06 41 00 "Architectural Casework".
 - 2. Toilet partitions and accessories in Division 10 "Specialties" Sections.
 - 3. Work in soffits and suspended ceilings.

1.4 SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Studs and Runners: Provide documentation that framing members' certification is according to SIFA's "Code Compliance Certification Program for Cold-Formed Steel Structural and Non-Structural Framing Members."
- B. Shop Drawings: Floor and ceiling plans indicating framing size, thickness and spacing.
 - 1. Section Details: As required for framing conditions indicated.
- C. Evaluation Reports: from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction for the following:
 - 1. For steel studs and runners and firestop tracks.
 - 2. For each ceiling suspension system, from ICC-ES.

1.5 QUALITY ASSURANCE

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Suspended ceilings shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
- B. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 119 by an independent testing agency.
- C. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.
- D. Horizontal Deflection: For wall assemblies, limited to 1/240 of the wall height based on horizontal loading of 5 lbf/sq. ft. (240 Pa).
- E. Vertical Deflection: For ceiling joists, soffit framing and suspension systems, deflection limited to 1/360 of the span for live loads and 1/240 for total loads of the span.
 - 1. Vertical Loading: 6 lbf/sq. ft.
 - a. Provide 13 lbf/sq. ft. (480 Pa) at ceilings indicated to have suspended items attached.
- F. Spacing:
 - 1. All interior wall and partition framing shall be 16 inches o.c. maximum. No wall assembly scheduled for tile or level 5 gypsum board finishes shall exceed 16 inches o.c. maximum.
 - 2. Wall assemblies concealed to view by cabinet or casework may be 24 inches o.c. maximum except where any portion of the wall is to receive tile finishes.
 - 3. At ceilings scheduled for level 5 finishes, framing shall be 16 inches o.c. maximum.

2.2 FRAMING SYSTEMS

- A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
 - 1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
 - 2. Protective Coating: ASTM A 653/A 653M, G60, hot-dip galvanized unless otherwise indicated.
- B. Studs and Runners: ASTM C 645. Use either steel studs and runners or embossed steel studs and runners.
 - 1. Steel Studs and Runners:
 - a. Minimum Base-Metal Thickness: As required by performance requirements for horizontal deflection and span.
 - b. Depth: As indicated on Drawings.
- C. Slip-Type Head Joints: Where indicated, provide one of the following:
 - 1. Clip System: Clips designed for use in head-of-wall deflection conditions that provide a positive attachment of studs to runners while allowing 2-inch (51-mm) minimum vertical movement.
 - 2. Double-Runner System: ASTM C 645 top runners, inside runner with 2-inch- (51-mm-) deep flanges in thickness not less than indicated for studs and fastened to studs, and outer runner sized to friction fit inside runner.

3. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
 - D. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.
 1. Minimum Base-Metal Thickness: As indicated on Drawings.
 - E. Cold-Rolled Channel Bridging: Steel, 0.0538-inch (1.367-mm) minimum base-metal thickness, with minimum 1/2-inch- (13-mm-) wide flanges.
 1. Depth: As indicated on Drawings.
 2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches (38 by 38 mm), 0.068-inch- (1.72-mm-) thick, galvanized steel.
 - F. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
 1. Minimum Base-Metal Thickness: As required by performance requirements for horizontal deflection and span.
 2. Depth: As indicated on Drawings.
 - G. Resilient Furring Channels: 1/2-inch- (13-mm-) deep, steel sheet members designed to reduce sound transmission.
 1. Configuration: Asymmetrical or hat shaped.
 - H. Cold-Rolled Furring Channels: 0.053-inch (1.34-mm) uncoated-steel thickness, with minimum 1/2-inch- (13-mm-) wide flanges.
 1. Depth: As indicated on Drawings.
 2. Furring Brackets: Adjustable, corrugated-edge-type steel sheet with minimum uncoated-steel thickness of 0.0329 inch (0.8 mm).
 3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- (1.59-mm-) diameter wire, or double strand of 0.048-inch- (1.21-mm-) diameter wire.
 - I. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches (32 mm), wall attachment flange of 7/8 inch (22 mm), minimum uncoated-metal thickness of 0.0179 inch (0.455 mm), and depth required to fit insulation thickness indicated.
 - J. Resilient Isolation Clip: Sound isolation clips for walls and ceiling assemblies.
 1. Basis-of-Design Product: IsoMax by Kinetics Noise Control, Inc.; www.kineticsnoise.com.
- 2.3 SUSPENSION SYSTEMS
- A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- (1.59-mm-) diameter wire, or double strand of 0.048-inch- (1.21-mm-) diameter wire.
 - B. Hanger Attachments to Metal Decking: Of type suitable for application and approved by Architect and Engineer.
 1. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated, and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing according to ASTM E 1190, conducted by a qualified testing and inspecting agency.
 - C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch (4.12 mm) in diameter.

- D. Flat Hangers: Steel sheet, size as required for application, with thickness required by performance requirements.
- E. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness required by performance requirements and minimum 1/2-inch- (13-mm-) wide flanges.
 - 1. Depth: 2 inches (51 mm); as required or indicated.
- F. Furring Channels (Furring Members):
 - 1. Cold-Rolled Channels: Minimum 0.0538-inch (1.367-mm) uncoated-steel thickness, with minimum 1/2-inch- (13-mm-) wide flanges, 3/4 inch (19 mm) deep.
 - 2. Steel Studs and Runners: ASTM C 645.
 - a. Minimum Base-Metal Thickness: As required by performance requirements for deflection and span.
 - b. Depth: As indicated on Drawings.
 - 3. Embossed Steel Studs and Runners: ASTM C 645.
 - a. Minimum Base-Metal Thickness: As required by performance requirements for deflection and span.
 - b. Depth: As indicated on Drawings.
 - 4. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch (22 mm) deep.
 - a. Minimum Base-Metal Thickness: As required by performance requirements for deflection and span.
 - 5. Resilient Furring Channels: 1/2-inch- (13-mm-) deep members designed to reduce sound transmission.
 - a. Configuration: Asymmetrical or hat shaped.
 - b. Basis-of-Design Products: RC Deluxe by Clark Dietrich; www.clarkdietrich.com.
- G. Grid Suspension System for Gypsum Board Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.

2.4 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards.
 - 1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
- B. Putty Pad Sealant: At acoustic rated partitions and fire-rated partitions in order to provide noise transmission resistance and fire resistance at electrical boxes and other penetrations. Refer to Section 07 84 13 "Penetration Firestopping".
 - 1. Approved Products:
 - a. Fire Barrier Moldable Putty Pads MPP+ by 3M; www.3m.com.
 - b. Firestop Putty Pad by Acoustical Solutions; [www.acousticalolutionss.com](http://www.acousticalsolutionss.com).
 - c. CP 617 Firestop Putty Pad by Hilti North America; www.hilti.com.
 - d. Fire-Rated Putty Pads by Metacaulk; www.metacaulk.com.
- C. Isolation Strip at Exterior Walls: Provide the following:
 - 1. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch (3.2 mm) thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.
 - 1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.
- B. Coordination with Sprayed Fire-Resistive Materials:
 - 1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches (610 mm) o.c.
 - 2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of non-load-bearing steel framing. Do not reduce thickness of fire-resistive materials below that are required for fire-resistance ratings indicated. Protect adjacent fire-resistive materials from damage.

3.3 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C 754.
 - 1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.
- B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.
- C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- D. Install bracing at terminations in assemblies.
- E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.
 - 1. Provide cantilevered framing where both sides of joints are to be single-member spanned.

3.4 INSTALLING FRAMED ASSEMBLIES

- A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
 - 1. Single-Layer Application: 16 inches (406 mm) o.c. unless otherwise indicated.
 - 2. Multilayer Application: 16 inches (406 mm) o.c. unless otherwise indicated.
 - 3. Tile Backing Panels: 16 inches (406 mm) o.c. unless otherwise indicated.
- B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

- C. Install studs so flanges within framing system point in same direction.
- D. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts that penetrate partitions above ceiling.
 - 1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
 - 2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
 - a. Install two studs at each jamb unless otherwise indicated.
 - b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch (13-mm) clearance from jamb stud to allow for installation of control joint in finished assembly.
 - c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
 - 3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
 - 4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
 - a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
 - 5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
- E. Direct Furring:
 - 1. Screw to framing.
 - 2. Weld or screw attach to structural framing, where permitted by Structural Engineer of Record.
- F. Z-Shaped Furring Members: Where indicated or required.
 - 1. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches (305 mm) from corner and cut insulation to fit.
- G. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch in 10 feet, measured from the plane formed by faces of adjacent framing.

3.5 INSTALLING SUSPENSION SYSTEMS

- A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
 - 1. Hangers: 48 inches (1219 mm) o.c.
 - 2. Carrying Channels (Main Runners): 48 inches (1219 mm) o.c.
 - 3. Furring Channels (Furring Members): 16 inches (406 mm) o.c., or as indicated.
- B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

- C. Suspend hangers from building structure as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
 - a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - 2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
 - a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
 - 3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 - 4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 - 5. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
 - 6. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.
- E. Seismic Bracing: Sway-brace suspension systems with hangers used for support.
- F. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.
- G. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet (3 mm in 3.6 m) measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION

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SECTION 09 24 23 - CEMENT STUCCO PLASTERING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes:
 - 1. Exterior cement stucco plastering.
 - 2. Cement backing panels.
 - 3. Water-resistive barrier.
- B. Related Sections
 - 1. Section 06 16 00 "Sheathing".
 - 2. Section 07 25 00 "Weather Barriers".
 - 3. Section 07 62 00 "Sheet Metal Flashing and Trim".
 - 4. Section 07 92 00 "Joint Sealants".

1.3 SUBMITTALS

- A. Manufacturer's specifications, details, installation instructions and product data.
- B. Manufacturer's code compliance report for air barrier and water-resistive barrier.
- C. EPS board manufacturer's certificate of compliance with ASTM E2430.
- D. Manufacturer's NFPA 285 assembly report or ICC ESR indicating compliance of air/moisture barrier and drainage mat with requirements of NFPA 285 for use on Types I, II, III, and IV construction.
- E. Manufacturer's standard warranty.
- F. Samples for approval as directed by architect and as follows:
 - 1. Metal Trim: For each exposed product and for each color and texture specified, 12 inches long by actual width.
- G. Fastener manufacturer's pull-out or withdrawal capacity testing for frame and solid substrates.
- H. Prepare and submit project-specific details (when required by contract documents).

1.4 QUALITY ASSURANCE

- A. Manufacturer Requirements:
 - 1. Stucco and air barrier products manufacturer for a minimum of 20 years.
 - 2. Stucco finish products and air barrier products manufactured under ISO 9001:2008 Quality System and 14001:2004 Environmental Management System.
- B. Contractor Requirements:
 - 1. Licensed, insured and engaged in application of portland cement stucco for a minimum of three (3) years.

2. Knowledgeable in the proper use and handling of manufacturer's materials and components.
3. Employ skilled mechanics who are experienced and knowledgeable in portland cement stucco application, and familiar with the requirements of the specified work.
4. Successful completion of minimum of three (3) projects of similar size and complexity to the specified project.
5. Provide the proper equipment, manpower and supervision on the job site to install the system in compliance with the manufacturer's published specifications and details and the project plans and specifications.

C. Mockup:

1. Construct full-scale mock-up of typical stucco/window wall assembly with specified tools and materials and test air and water infiltration and structural performance in accordance with ASTM E283, ASTM E331 and ASTM E330, respectively.
2. Mock-up shall comply with requirements of project specifications.
3. Accurately record construction detailing and sequencing of approved mock-up for replication during construction.

D. Testing: Following testing of the mock-up, maintain approved mock-up at the Project site as reference standard.

1. Conduct air barrier adhesion testing in accordance with ASTM D4541.
2. Conduct air barrier assembly testing in accordance with ASTM E783.
3. Conduct pull-out or withdrawal capacity testing of proposed fasteners for lath attachment into concrete or masonry and verify adequacy with respect to negative design wind pressure. Conduct sufficient tests such that reliable and predictable pull-out values are obtained. Verify adequacy of pull-out or withdrawal capacity of fasteners used for frame construction with manufacturer in relation to negative design wind pressures.
4. Conduct pH testing to check stucco surface alkalinity before application of primer or finish materials. Where alkaline resistant primer is used pH testing may be waived.
5. Conduct wet sealant adhesion testing in accordance with sealant manufacturer's field quality control test procedure.
6. Notify design professional minimum 7 calendar days prior to testing.

E. Inspections

1. Provide inspection where required by code or contract documents.
2. Conduct inspections in accordance with code requirements and contract documents.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver all materials in their original sealed containers bearing manufacturer's name and identification of product.
- B. Protect insulation materials from prolonged UV exposure, keep away from sources of heat, sparks, flame, flammable or volatile materials. Store on a clean, flat surface, off the ground in a dry area.
- C. Protect coatings (pail products) from freezing and temperatures in excess of 90 deg. F. Store away from direct sunlight.
- D. Protect portland cement based materials (bag products) from moisture and humidity. Store under cover off the ground in a dry location.

- E. Handle all products as directed on labeling.

1.6 PROJECT SITE CONDITIONS

- A. Maintain ambient and surface temperatures above 40 deg. F during application and for 24 hours after set of stucco, and after application of air/moisture barrier and finish materials.
- B. Provide supplementary heat for installation in temperatures less than 40 deg. F such that material temperatures are maintained as in 1.09A. Prevent concentration of heat on uncured stucco and vent fumes and other products of combustion to the outside to prevent contact with stucco.
- C. Prevent uneven or excessive evaporation of moisture from stucco during hot, dry or windy weather. For installation under any of these conditions provide special measures to properly moist cure the stucco. Do not install stucco if ambient temperatures are expected to rise above 100 deg. F within a 24-hour period.
- D. Provide protection of surrounding areas and adjacent surfaces from application of materials.

1.7 COORDINATION

- A. Protect sheathing from climatic conditions to prevent weather damage until the installation of the waterproof air barrier.
- B. Install diverter flashings wherever water can enter the wall assembly to direct water to the exterior.
- C. Coordinate installation of foundation waterproofing, roofing membrane, windows, doors and other wall penetrations to provide a continuous air barrier and continuous moisture protection. Provide protection of rough openings before installing windows, doors, and other penetrations through the wall and provide sill flashing. Coordinate installation of waterproof air barrier components with window and door installation to provide weather proofing of the structure and to prevent moisture infiltration and excess air infiltration.
- D. Install window and door head flashing immediately after windows and doors are installed.
- E. Protect air/moisture barrier with stucco cladding within 180 days of installation.
- F. Protect drainage mat with stucco cladding within 30 days of installation.
- G. Commence the stucco installation after completion of all floor, roof construction and other construction that imposes dead loads on the walls to prevent excessive deflection (and potential cracking) of the stucco.
- H. Sequence interior work such as drywall installation prior to stucco installation to prevent stud distortion (and potential cracking) of the stucco.
- I. Provide site grading such that the stucco terminates above earth grade minimum 4 inches and above finished grade (pavers/sidewalk) minimum 2 inches. Provide increased clearance in freeze/thaw climate zones.
- J. Install copings and sealant immediately after installation of the stucco and when finish coatings are dry.
- K. Attach penetrations through stucco to structural support and provide air tight and water tight seals at penetrations.

1.8 WARRANTY

- A. Provide manufacturer's standard warranty.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General: All system components shall meet the following requirements, where applicable:
 - 1. Accelerated Weathering, ASTM G154: 2000 hours, no blistering, checking cracking, crazing, or other deleterious effects.
 - 2. Surface Burning, ASTM E84: Flame Spread less than 25, Smoke Developed less than 450, Class A building material.
 - 3. Flame Propagation, NFPA 285: meets requirements for use on noncombustible (Types I, II, III, and IV) construction.
- B. Weather Barrier:
 - 1. Compliant with ICC ES Acceptance Criteria AC 212 (ICC ESR 1233).
 - 2. Material Air Leakage Resistance, ASTM E2178: less than 0.004 cfm/ft² at 1.57 psf.
 - 3. Assembly Air Leakage Resistance, ASTM E2357: less than 0.04 cfm/ft² at 1.57 psf.
 - 4. Water Vapor Permeance, ASTM E96, Method B: greater than 12 perms.
 - 5. Tensile Adhesion, ASTM C297:
 - a. Gypsum Sheathing, exceeds strength of substrate.
 - b. Plywood, > 85 psi.
 - c. OSB, > 30 psi.
 - 6. VOCs, calculation:
 - a. Less than 100 g/L.
 - b. Compliant with US EPA 40 CFR 59 for waterproofing/sealer.
 - c. Compliant with South Coast AQMD Rule 1113 for waterproofing/sealer.
- C. Stucco Base: Stucco scratch and brown coat materials shall comply with ASTM C926.
- D. Primers:
 - 1. Resistant to alkaline surfaces with pH of 13 or less
 - 2. VOC: Less than 50 g/L, compliant with South Coast AQMD Rule 1113 for architectural coatings
- E. Finishes:
 - 1. Water Vapor Permeability, ASTM E96, Method B: Less than 5 perms.
 - 2. VOCs: Less than 50 g/L, compliant with South Coast AQMD Rule 1113 for architectural coatings.

2.2 CEMENT PLASTER

- A. Stucco Finish Systems:
 - 1. Basis-of-Design Product: Sto Powerwall ci System by Sto Corp.; www.stocorp.com.
- B. Weather Barrier: Fluid-applied air- and water-resistive barrier system for sheathing, concrete, and concrete masonry substrates.
 - 1. Basis-of-Design Product: As recommended by manufacturer.

- C. Flashing:
 - 1. Waterproof air barrier material for rough opening protection, sheathing joints, and concrete masonry unit (CMU) crack repair.
 - a. Basis-of-Design Products: Provide as recommended by the plaster system manufacturer:
 - 2. For foil-faced and high temperature flexible flashings, refer to Section 07 25 00 "Weather Barriers".
- D. Stucco: Portland cement-based stucco concentrate in compliance with ASTM C926.
 - 1. Basis-of-Design Product: Sto BTS Plus by Sto Corp.
- E. Scratch and Brown Coats: As recommended by manufacturer.
- F. Leveling and Reinforcing Coat: Two-component copolymer based base coat material field mixed with portland cement.
 - 1. Basis-of-Design Products: As recommended by manufacturer.
- G. Reinforcing Mesh for EIFS: Balanced, alkali-resistant, open-weave, glass-fiber mesh treated for compatibility with other EIFS materials, made from continuous multi-end strands with retained mesh tensile strength of not less than 120 lbf/in. according to ASTM E2098 and the following:
 - 1. Standard Mesh: Nominal 4.5 oz/yd², symmetrical, interlaced open-weave glass fiber fabric made with alkaline resistant coating for compatibility with finish system.
 - a. Basis-of-Design Product: Sto Mesh by Sto Corp.
 - 2. High Impact Mesh: Nominal 11.2 oz./yd², high impact, interwoven, open weave glass fiber fabric with alkaline resistant coating for compatibility with finish system.
 - a. Basis-of-Design Product: Sto Intermediate Mesh by Sto Corp.
 - 3. Ultra-High Impact Mesh: Nominal 15 oz/yd², ultra high impact, double strand, interwoven, open-weave glass fiber fabric with alkaline resistant coating for compatibility with finish system.
 - a. Basis-of-Design Product: Sto Armor Mat by Sto Corp.
 - b. Application: 6'-0" minimum above finished grade at all areas accessible to pedestrian traffic and other areas exposed to abnormal stress or impact.
- H. Exterior Stucco Finish Coat: Provide the following, or as appropriate per manufacturer's recommendations:
 - 1. Factory-mixed formulation of polymer-emulsion binder, colorfast mineral pigments.
 - 2. Colors: As selected by Architect from manufacturer's full range.
 - 3. Textures: As selected by Architect from manufacturer's full range.
 - 4. Basis-of-Design Product: Stolit by Sto Corp.
- I. Exterior Stucco Color Coat: Provide the following, as appropriate per manufacturer's recommendations:
 - 1. Exterior Stucco Color Coat by Sto Corp.
 - 2. Colors: As selected by Architect.
- J. Optional Bonding Agent: As recommended by manufacturer.
 - 1. INSULATION

- K. Molded, (Expanded) Rigid Cellular Polystyrene Board Insulation: Comply with ASTM E2430/E2430M, unless otherwise noted, and the following:
 - 1. Basis-of-Design Product: Sto EPS Insulation Board by Sto Corp.
 - 2. Flame-Spread and Smoke-Developed Indexes: 25 and 450 or less, respectively, according to ASTM E84.
 - 3. Dimensions: Provide insulation boards of not more than 24 by 48 inches, with thickness indicated in Drawings.
 - 4. Foam Buildouts: Provide with profiles and dimensions indicated in Drawings.
- L. Adhesive and Base Coat for Insulation: Modified portland cement adhesive and basecoat mix.
 - 1. Basis-of-Design Products: As recommended by manufacturer.

2.3 METAL LATH

- A. Expanded-Metal Lath: ASTM C847, cold-rolled carbon-steel sheet with ASTM A653/A653M, G60 (Z180), hot-dip galvanized-zinc coating. Provide the following type, or as recommended by cement plaster manufacturer.
 - 1. Diamond-Mesh Lath: Flat, 3.4 lb/sq. yd.

2.4 MECHANICAL FASTENERS

- A. Non-corroding fasteners in compliance with AISI S200 and ASTM C 1513:
 - 1. Steel Framing: Minimum #8 Type S or S-12 wafer head fully threaded corrosion resistant screws with minimum 3/8 inch and three thread penetration into studs.
 - 2. Concrete or Masonry: Minimum # 8 wafer head fully threaded corrosion resistant screws for masonry with minimum 1-inch penetration into substrate.
- B. Tie Wire: 18 gauge galvanized and annealed low-carbon steel in compliance with ASTM A641 with Class I coating.

2.5 ACCESSORIES

- A. Weep screed, casing bead, corner bead, corner lath, expansion and control joint accessories. All accessories shall meet the requirements of ASTM C1063 and its referenced documents.
 - 1. Galvanized metal in compliance with ASTM A653 with G60 coating.
- B. Metal Trim:
 - 1. Material: 14 gauge sheet metal angle.
 - 2. Profile: As indicated on Drawings.
 - 3. Finish: Color to be approved by Architect; refer to Section 09 91 00 "Painting".
 - 4. Installation: Adhesive.
- C. All accessories shall have perforated or expanded flanges and shall be designed with grounds for the specified thickness of stucco.

2.6 MISCELLANEOUS MATERIALS

- A. Water for Mixing and Finishing Plaster: Potable and free of substances capable of affecting plaster set or of damaging plaster, lath, or accessories.
- B. Fiber for Base Coat: Alkaline-resistant glass or polypropylene fibers, 1/2 inch long, free of contaminants, manufactured for use in cement plaster.
- C. Bonding Compound: ASTM C932.

- D. Fasteners for Attaching Metal Lath to Substrates: ASTM C1063.
- E. Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper, not less than 0.0475-inch diameter unless otherwise indicated.

2.7 JOB MIXED INGREDIENTS

- A. Water: Clean and potable.
- B. Sand: Complying with ASTM C897 or ASTM C144, for use with one coat and ASTM C926 stucco concentrates.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Inspect substrate surfaces for:
 - 1. Contamination from algae, dirt, dust, efflorescence, form oil, fungus, grease, laitance, mildew or other foreign substances.
 - 2. Surface absorption and chalkiness.
 - 3. Cracks: Measure crack width and record location of cracks.
 - 4. Damage and deterioration.
 - 5. Moisture damage: Record any areas of moisture damage.
- B. Inspect sheathing application for compliance with applicable requirement:
 - 1. Glass Mat Faced Gypsum Sheathing: Confirm in compliance with ASTM C1177.
 - 2. Exterior Grade and Exposure 1 Wood-Based Sheathing: Confirm in compliance with APA Engineered Wood Association E 30.
- C. Report deviations from the requirements of project specifications or other conditions that might adversely affect the air/moisture barrier or stucco installation to the General Contractor.
- D. Do not proceed with air/moisture barrier or stucco installation until deviations are corrected.

3.2 SURFACE PREPARATION

- A. Concrete and Concrete Masonry (CMU)
 - 1. Remove surface contamination such as oil, grease, dust, dirt, algae, mildew, salts, paint or coatings. Correct weak surface conditions such as laitance. Use chemical cleaners such as TSP (trisodium phosphate) detergent to remove oil and grease and rinse with potable water. Use chemical cleaners to remove efflorescence or other surface contamination in accordance with manufacturer's written instructions. Use mechanical methods such as waterblasting, sandblasting, and wire brushing to remove weak surface conditions.
 - 2. Repair cracks up to 1/8 inch wide by raking with a sharp tool to remove loose, friable material and blow clean with oil-free compressed air. Apply joint treatment material over crack, embed reinforcement (where applicable), and smooth joint treatment material with a trowel, drywall or putty knife to cover the reinforcement.
 - 3. Remove projecting fins, ridges, and mortar by mechanical means.
 - 4. Fill honeycombs, aggregate pockets, holes and other voids with Sto patching material.
 - 5. Where the surface is excessively "rough" or out of plane, skim coat the wall surface with Sto base coat material to provide a smooth, level surface.

B. Sheathing

1. Remove surface contaminants and replace damaged sheathing.
2. All sheathing must be handled and installed in compliance with applicable building code and/or manufacturer requirements. Installed sheathing must be clean, dry and free from damage, frost, and all bond-inhibiting materials. Abut gypsum sheathing joints. Gap wood sheathing 1/8 inch at joints. Should gaps exceed 1/8 inch up to 1/2 inch wide, use StoGuard RapidFill to fill joints, or apply low expanding urethane foam into joints and rasp or shave flush with sheathing surface in preparation for installation of StoGuard joint treatment.
3. Spot surface defects in sheathing with joint treatment (Sto Gold Fill, StoGuard RapidSeal, StoGuard RapidFill, or Sto EmeraldCoat).

3.3 AIR/MOISTURE BARRIER INSTALLATION

A. The following instructions are applicable to:

1. Exterior or Exposure I Plywood in compliance with PS-1.
2. Glass Mat Faced Gypsum Sheathing in compliance with ASTM C1177.
3. Concrete and Concrete Masonry surfaces.

B. Transition Detailing: At floor line deflection joints up to 1 inch wide, stucco expansion joints formed with back-to-back casing beads, and static joints and transitions:

1. Apply waterproof coating liberally to properly prepared surfaces with brush, roller, or spray.
2. Place pre-cut lengths of transition membrane centered over the transition in the wet coating. At changes in plane crease the membrane and similarly place the membrane material in the wet coating. At floor line deflection joints achieve a slightly concave profile (recessed into the joint) of the membrane.
3. Immediately top coat the membrane with additional coating and apply pressure with brush or roller to fully embed the membrane in the coating and achieve a smooth and wrinkle-free surface without gaps or voids.
4. Apply coating liberally along all top horizontal edges on walls and along all edges on balcony floor slabs to fully seal the edges.
5. Overlap minimum 2 inches at ends and adhere lap seams together with coating. Shingle lap vertical seams and vertical to horizontal intersections with minimum 2-inch overlap.

C. Transition Detailing: At movement joints up to 1 inch wide with up to + 50 percent movement such as masonry control joints, and through wall joints in masonry or frame construction:

1. Insert backer rod sized to friction fit in the joint (diameter 25 percent greater than joint width).
2. Recess the backer rod 1/2 inch.
3. Apply the waterproof coating liberally to properly prepared surfaces with brush, roller, or spray along the outer surface on each side of the joint (not in the joint).
4. Immediately place the membrane by looping it into the joint against the backer rod surface to provide slack.
5. Embed the membrane in the wet coating along the outer surface on the sides of the joint by top coating with additional coating material and applying pressure with a brush or roller.

D. For all applications, after the membrane installation is complete and the waterproof coating is dry:

1. Apply a final liberal coat of the waterproof coating to all top horizontal edges on walls to ensure waterproofing integrity. Similarly apply coating at all edges on balcony floor slabs.

2. Inspect the installed membrane for fish mouths, wrinkles, gaps, holes or other deficiencies. Correct fish mouths or wrinkles by cutting, then embedding the area with additional coating applied under and over the membrane.
 3. Seal gaps, holes, and complex geometries at three dimensional corners with one-component, quick-drying, waterproof air barrier material.
- E. Transition Detailing: At flashing shingle laps, and through wall penetrations such as pipes, electrical boxes, and scupper penetrations:
1. Flashing leg or penetration flange shall be seated flat against the wall surface without gaps. Apply one-component, quick-drying, waterproof air barrier material liberally with caulking gun in a zig-zag pattern across the flashing leg or flange/wall surface seam and spread to a thickness that covers the flange and fastener penetrations and directs water away from the wall. Extend application minimum 1 inch onto both surfaces (flashing leg/flange and wall surface).
 2. At through wall penetrations without flanges ensure the penetrating element (i.e., pipe or scupper) is fitted snug against abutting wall surfaces. Apply a fillet bead with a caulking gun around the penetration and tool against both surfaces (penetration and wall surface) to create a bead profile that directs water away from the penetration. Extend application minimum 1 inch onto both surfaces.
- F. Rough Opening Protection:
1. Apply 9 inch wide self-adhesive, flexible, symmetrical, interlaced glass fiber mesh at rough openings. Immediately apply ready-mixed, acrylic-based, flexible joint treatment by spray or trowel over the mesh and spread with a trowel to create a smooth surface that completely covers the mesh.
- G. Sheathing Joint Treatment:
1. Place 4 inch wide self-adhesive, flexible, symmetrical, interlaced glass fiber mesh centered along sheathing joints and minimum 9 inch wide mesh centered and folded at inside and outside corners. Immediately apply ready-mixed, acrylic-based, flexible joint treatment by spray or trowel and spread with a trowel to create a smooth surface that completely covers the mesh.
- H. Air/Moisture Barrier Coating Installation
1. Plywood and Gypsum Sheathing: apply waterproof coating by spray or roller over sheathing surface, including the dry joint treatment, rough opening protection, and transition areas, to a uniform wet mil thickness of 10 mils in one coat. Use 1/2-inch nap roller for plywood. Use 3/4-inch nap roller for glass mat faced gypsum sheathing. Protect from weather until dry.
 2. CMU Surfaces:
 - a. Repair static cracks up to 1/2 inch wide with ready-mixed, acrylic-based, flexible joint treatment. Rake the crack with a sharp tool to remove loose or friable material and blow clean with oil-free compressed air. Apply the crack filler with a trowel or putty knife over the crack and tool the surface smooth. Protect repair from weather until dry.
 - b. Liberally apply two coats of ready-mixed, flexible, waterproof coating to the surface with a 3/4-inch nap roller or spray equipment to a minimum wet thickness of 10 to 30 mils each, depending on surface condition. Additional coats may be necessary to provide a void and pinhole free surface. Protect from weather until dry.
- I. Air /Moisture Barrier Connections and Shingle Laps
1. Coordinate installation of connecting air barrier components with other trades to provide a continuous air tight membrane.

2. Coordinate installation of flashing and other moisture protection components with other trades to achieve complete moisture protection such that water is directed to the exterior, not into the wall assembly, and drained to the exterior at sources of leaks (windows, doors and similar penetrations through the wall assembly).
3. Splice-in head flashings above windows, doors, floor lines, roof/sidewall step flashing, and similar locations with manufacturer's detail component to achieve shingle lap of the air/moisture barrier such that water is directed to the exterior.

3.4 SHEET WATER-RESISTIVE BARRIER INSTALLATION

- A. Install in compliance with the applicable building code requirements for building paper. Lap paper over foundation weep screed attachment flange, floor line flashing, and window/door head flashings.

3.5 DRAINAGE MAT INSTALLATION

- A. Place drainage mat against the wall surface over the insulation and unroll horizontally with the fabric facing out. Hammer-tack or staple into sheathing with corrosion-resistant fasteners. Use as few fasteners as needed to hold the mat in place, starting from the bottom of the wall at base flashing or weep screed and working up. Do not fasten through flashing.
- B. Shingle lap fabric at horizontal courses. Shingle lap drainage mat over flashing at floor lines, decks, roof lines, window heads, and other areas where flashing is required, to direct water to the exterior. Butt ends of rolls and vertical seams.
- C. Trim around windows, doors, vents, or other penetrations through the wall. Do not install behind window nail flanges.
- D. Immediately follow installation of drainage mat with stucco lath installation. Where stucco lath installation will not immediately follow installation of drainage mat, use corrosion-resistant cap nails, cap staples, or cap screws every 16 inches on center along framing for more secure attachment. Cover drainage mat with stucco within 30 days of installation.

3.6 STUCCO INSTALLATION

- A. After satisfactory inspection of surfaces and correction of any deviations from specification requirements commence the stucco installation as described below:
- B. Installation Over Drainage Mat:
 1. Weep Screed Installation: Install foundation weep screed at the base of the wall securely to solid substrate or framing with the appropriate fastener. Locate foundation weep screed so that it overlaps the joint between the foundation and framing by a minimum of 1 inch. Locate the foundation weep screed nosing minimum 4 inches above earth grade, 2 inches above finished grade (paved surfaces, for example).
 2. Lap waterproof air barrier, sheet water-resistive barrier, and drainage mat over the weep screed attachment flange.
 3. Casing Bead and Two-Piece Expansion Joint Installation: Install casing beads at stucco terminations and through wall penetrations. Install two-piece expansion joints (or back-to-back casing beads) at building expansion joints, thru-wall joints in concrete or CMU, where the stucco is to be installed over dissimilar construction or substrates, at changes in building height, at floor lines, columns, and cantilevered areas. Install full accessory pieces where possible and avoid small pieces. Seal adjoining pieces by embedding ends in sealant. Abut horizontal into vertical joint accessories (except where horizontal movement joints exist that prevent continuous vertical runs of accessories). Attach at no more than 7 inches into solid substrate/framing with appropriate fasteners.

4. Lath Installation: Diamond mesh metal lath, conform to ASTM C1063.
 - a. General: Install metal lath with the long dimension at right angles to structural framing (horizontally on solid substrates). Terminate lath at expansion joints. Do not install continuously at joints.
 - b. Seams/ Overlaps: Overlap side seams minimum 1/2 inch and end seams minimum 1 inch. Stagger end seams. Overlap casing beads and expansion joints minimum 1 inch over narrow wing accessories, minimum 2 inches over expanded flange accessories. Do not install lath continuously beneath expansion joints.
 - c. Attachment: Fasten securely into solid substrates or through sheathing into structural framing at 7 inches on center maximum vertically and 16 inches on center horizontally*. Wire tie at no more than 9 inches on center at: side laps, accessory overlaps, and where end laps occur between supports.
5. One Piece Expansion Joint Installation:
 - a. Install one-piece expansion joints at through wall penetrations, for example, above and below doors and windows. Install one-piece expansion joints at every 144 ft². Wire tie one-piece expansion joints to lath at no more than 7 inches on center. Seal adjoining pieces by embedding ends in sealant. Make certain lath is discontinuous at or beneath joints.
6. Inside and Outside Corners:
 - a. Install corner lath at inside corners and corner bead at outside corners over lath. Attach through lath into solid substrate or framing at no more than 7 inches on center with appropriate fasteners.
7. Stucco Installation
 - a. Scratch Coat: apply stucco with sufficient pressure to key into and embed the metal lath. Apply sufficient material, 3/8 or 1/2 inch, to cover the metal lath and to permit scoring the surface. Score the stucco upon completion of each panel in preparation for a second coat. Score horizontally.
 - b. Brown Coat: as soon as the first coat is firm enough to receive the second coat without damage, apply the second coat. Alternatively, moist cure the first coat up to 48 hours and dampen the scratched surface with water immediately before applying the second coat. Apply the second coat with sufficient pressure to ensure intimate contact with the first coat and as needed to bring the stucco to a uniform thickness that matches the grounds of the accessories. Use a rod or straight edge to bring the surface to a true, even plane. Fill depressions in plane with stucco. Final thickness of stucco shall be uniform throughout the wall area and shall be either 3/4 inch or 7/8 inch, and shall not exceed 7/8 inch.
 - c. After the stucco has become slightly firm float the surface lightly with a darby or wood float to densify the surface and to provide a smooth, even surface. The proper time to float is when the wood float no longer sticks to the surface of the stucco.
 - d. Moist cure after the stucco has set by lightly fogging for at least 48 hours. Fog as frequently as required during the 48-hour period to prevent loss of moisture from the stucco. Avoid eroding the stucco surface with excess moisture. If relative humidity exceeds 75 percent, the frequency of moist curing may be diminished.
- C. Crack Defense:
 1. Apply base coat over the moist cured stucco with appropriate spray equipment or a stainless steel trowel to a uniform thickness of approximately 1/8 inch. Work horizontally or vertically in strips of 40 inches, and immediately embed the mesh into the wet base coat by troweling from the center to the edge of the mesh.

2. Overlap mesh not less than 2-1/2 inches at mesh seams and at overlaps of detail mesh. Feather seams and edges. Avoid wrinkles in the mesh. The mesh must be fully embedded so that no mesh color shows through the base coat when it is dry. Re-skim with additional base coat if mesh color is visible. Do not install base coat or mesh over joints or accessories in the stucco wall assembly.

D. Primer Installation:

1. Primer at Freshly Placed and High pH Stucco Surfaces: Moist cure stucco for a minimum of 48 hours. Allow stucco to dry an additional 48 hours, then apply primer evenly with brush, roller or proper spray equipment over the clean, dry stucco and foam build-outs, and allow to dry. Final age of primed stucco application must be minimum 7 days before application of finish.
2. Sanded or Tinted Primer at Fully Cured or Low pH Stucco Surfaces: Moist cure stucco for a minimum of 48 hours. Wait until stucco is 28 days old or the pH level of the surface is below 10 before applying primer. Final age of primed stucco application must be minimum 28 days before application of finish or pH must be below 10.

E. Finish Installation:

1. Apply finish to minimum 28-day old stucco or primed stucco and foam build-outs, or apply when pH of stucco surface is less than 10. If primer for freshly placed and high pH stucco surfaces was used as the primer the primed stucco/foam build-out surfaces need only be minimum 7 days old. Apply finish by spraying or troweling with a stainless steel trowel, depending on the finish specified. Follow these general rules for application of finish:
 - a. Avoid application in direct sunlight.
 - b. Apply finish in a continuous application, and work a wet edge towards the unfinished wall area. Work to an architectural break in the wall before stopping to avoid cold joints.
 - c. Weather conditions affect application and drying time. Hot or dry conditions limit working time and accelerate drying. Adjustments in the scheduling of work may be required to achieve desired results; cool or damp conditions extend working time and retard drying and may require added measures of protection against wind, dust, dirt, rain and freezing. Adjust work schedule and provide protection.
 - d. Do not install separate batches of finish side-by-side.
 - e. Do not apply finish into or over sealant joints. Apply finish to outside face of wall only.
 - f. Do not apply finish over irregular or unprepared surfaces, or surfaces not in compliance with the requirements of the project specifications.
 - g. Do not install finish over high pH (greater than or equal to 10) stucco surfaces or surfaces that have not been fully cured.

3.7 PROTECTION

- A. Provide protection of installed materials from water infiltration into or behind them.
- B. Provide protection of installed stucco from dust, dirt, precipitation, and freezing.
- C. Provide protection of installed primer and finish from dust, dirt, precipitation, freezing and continuous high humidity until fully dry.
- D. Provide sealant and backer material at stucco terminations and at fixture penetrations through the stucco to protect against air, water and insect infiltration. Provide weeps at floor lines, window and door heads, and other areas to conduct water to the exterior.

3.8 CLEANING, REPAIR AND MAINTENANCE

- A. Clean and maintain the stucco finish for a fresh appearance and to prevent water entry into and behind the stucco. Repair cracks, impact damage, spalls or delamination promptly.
- B. Maintain adjacent components of construction such as sealants, windows, doors, and flashing, to prevent water entry into the wall assembly.
- C. Refer to manufacturer's repair and maintenance guide for detailed information on stucco restoration – cleaning, repairs, recoating, resurfacing and refinishing, or re-cladding.

END OF SECTION

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SECTION 09 29 00 - GYPSUM BOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Interior gypsum board.
2. Exterior gypsum board for ceilings and soffits.
3. Tile backing panels.
4. Acoustic insulation.
5. Acoustical sealants.

B. Related Requirements:

1. Section 06 10 00 "Rough Carpentry" for framing substrate for gypsum board and plywood sheathing for exterior walls.
2. Section 09 22 16 "Non-Structural Metal Framing" for non-structural steel framing and suspension systems that support gypsum board panels.

1.3 SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For the following products:

1. Trim Accessories: Full-size Sample in 12-inch- long length for each trim accessory indicated.

1.4 QUALITY ASSURANCE

A. Mockups: Build mockups of at least 100 sq. ft. in surface area to demonstrate aesthetic effects and to set quality standards for materials and execution.

1. Build mockups for the following:
 - a. Each level of gypsum board finish indicated for use in exposed locations.
 - b. Each texture finish indicated.
2. Apply or install final decoration indicated, including painting and wallcoverings, on exposed surfaces for review of mockups.
3. Simulate finished lighting conditions for review of mockups.
4. 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. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.6 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written instructions, whichever are more stringent.
- B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, moisture damaged, and mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 GYPSUM BOARD, GENERAL

- A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

- A. Gypsum Wallboard: ASTM C 1396/C 1396M.
 - 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. CertainTeed Corporation.
 - b. National Gypsum Company.
 - c. PABCO Gypsum.
 - d. USG Corporation.
 - 2. Thickness: 5/8 inch.
 - 3. Long Edges: Tapered.
- B. Gypsum Board (GBD), Type X: ASTM C 1396/C 1396M.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. CertainTeed Corporation.
 - b. National Gypsum Company.
 - c. PABCO Gypsum.
 - d. USG Corporation.
 - 2. Thickness: 5/8 inch.

3. Long Edges: Tapered.
- C. Gypsum Ceiling Board: ASTM C 1396/C 1396M.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. CertainTeed Corporation.
 - b. National Gypsum Company.
 - c. PABCO Gypsum.
 - d. USG Corporation.
 2. Thickness: 1/2 inch.
 3. Long Edges: Tapered.
- D. Abuse-Resistant Gypsum Board: ASTM C 1396/C 1396M gypsum board, tested according to ASTM C 1629/C 1629M.
 1. Core: 5/8 inch, Type X.
 2. Surface Abrasion: ASTM C 1629/C 1629M, meets or exceeds Level 3 requirements.
 3. Indentation: ASTM C 1629/C 1629M, meets or exceeds Level 3 requirements.
 4. Soft-Body Impact: ASTM C 1629/C 1629M, meets or exceeds Level 3 requirements.
 5. Long Edges: Tapered.
 6. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
- E. Impact-Resistant Gypsum Board: ASTM C 1396/C 1396M gypsum board, tested according to ASTM C 1629/C 1629M.
 1. Core: 5/8 inch, Type X.
 2. Surface Abrasion: ASTM C 1629/C 1629M, meets or exceeds Level 3 requirements.
 3. Indentation: ASTM C 1629/C 1629M, meets or exceeds Level 3 requirements.
 4. Soft-Body Impact: ASTM C 1629/C 1629M, meets or exceeds Level 3 requirements.
 5. Long Edges: Tapered.
 6. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
- F. Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces.
 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. CertainTeed Corporation.
 - b. National Gypsum Company.
 - c. PABCO Gypsum.
 - d. USG Corporation.
 2. Core: As indicated 5/8 inch, Type X.
 3. Long Edges: Tapered.
 4. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.4 EXTERIOR GYPSUM BOARD FOR CEILINGS AND SOFFITS

- A. Exterior Gypsum Soffit Board: ASTM C 1396/C 1396M, with manufacturer's standard edges.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. CertainTeed Corporation.
 - b. National Gypsum Company.
 - c. PABCO Gypsum.
 - d. USG Corporation.

2.5 TILE BACKING PANELS

- A. Cementitious Backer Units: ANSI A118.9 and ASTM C 1288 or ASTM C 1325, with manufacturer's standard edges.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. C-Cure.
 - b. CertainTeed Corporation.
 - c. Custom Building Products.
 - d. FinPan, Inc.
 - e. James Hardie Building Products, Inc.
 - f. National Gypsum Company.
 - g. USG Corporation.
 - 2. Thickness: 1/2 inch.
 - 3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.6 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.
 - 1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
 - 2. Shapes:
 - a. Cornerbead.
 - b. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - c. L-Bead: L-shaped; exposed long flange receives joint compound.
 - d. Expansion (control) joint.
- B. Exterior Trim: ASTM C 1047.
 - 1. Material: Rolled zinc.
 - 2. Shapes:
 - a. Cornerbead.
 - b. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - c. Expansion (Control) Joint: One-piece, rolled zinc with V-shaped slot and removable strip covering slot opening.

2.7 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
 - 1. Interior Gypsum Board: Paper.
 - 2. Exterior Gypsum Soffit Board: Paper.
 - 3. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.
 - 4. Tile Backing Panels: As recommended by panel manufacturer.
- C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.
 - 1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
 - 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
 - a. Use setting-type compound for installing paper-faced metal trim accessories.
 - 3. Fill Coat: For second coat, use drying-type, all-purpose compound.
 - 4. Finish Coat: For third coat, use drying-type, all-purpose compound.
 - 5. Skim Coat: For final coat of Level 5 finish, use drying-type, all-purpose compound.
- D. Joint Compound for Exterior Applications:
 - 1. Exterior Gypsum Soffit Board: Use setting-type taping compound and setting-type, sandable topping compound.
 - 2. Glass-Mat Gypsum Sheathing Board: As recommended by sheathing board manufacturer.
- E. Joint Compound for Tile Backing Panels:
 - 1. Glass-Mat, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.
 - 2. Cementitious Backer Units: As recommended by backer unit manufacturer.

2.8 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.
- B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
 - 1. Adhesives shall have a VOC content of 50 g/L or less.
 - 2. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- C. Steel Drill Screws: ASTM C 1002 unless otherwise indicated.
 - 1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
 - 2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

- D. Sound-Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
 - 1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
 - 2. Basis-of-Design Product: Safe'n'Sound by Rockwool; www.rockwool.com.
 - a. Thickness: As required to fill stud cavity in friction-fit application.
- E. Acoustical Sealant, ACOUSTICAL SEALANT: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
 - 1. Basis-of-Design Product: Quiet Seal Pro by Quiet Rock; www.quietrock.com.
 - 2. Other Approved Manufacturers:
 - a. Accumetric LLC.
 - b. Franklin International.
 - c. Grabber Construction Products.
 - d. Hilti, Inc.
 - e. Pecora Corporation.
 - f. Specified Technologies, Inc.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
 2. Fit gypsum panels around ducts, pipes, and conduits.
 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch- wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written instructions for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
- J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
1. Type X: As indicated on Drawings Where required for fire-resistance-rated assembly.
 2. Ceiling Type: Ceiling surfaces.
 3. Impact-Resistant Type: As indicated on Drawings.
 4. Mold-Resistant Type: Provide in lieu of regular gypsum board at all backsplash and surrounding areas of sinks, lavatories, drinking fountains, and mop sinks, to a distance of not less than 18 inches from edge of sinks, lavatories, drinking fountains, and mop sink, to a distance not less than 18 inches from edge of sinks, lavatories and mop sinks.
 5. Glass-Mat Interior Type: As indicated on Drawings.
 6. Skim-Coated Type: As indicated on Drawings.
- B. Single-Layer Application:
1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
 2. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
 3. On Z-shaped furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
 4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.
- C. Multilayer Application:

1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
 2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
 3. On Z-shaped furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
 4. Fastening Methods: Fasten base layers with screws; fasten face layers with adhesive and supplementary fasteners.
- D. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written instructions and temporarily brace or fasten gypsum panels until fastening adhesive has set.
- 3.4 APPLYING EXTERIOR GYPSUM PANELS FOR CEILINGS AND SOFFITS
- A. Apply panels perpendicular to supports, with end joints staggered and located over supports.
1. Install with 1/4-inch open space where panels abut other construction or structural penetrations.
 2. Fasten with corrosion-resistant screws.
- 3.5 APPLYING TILE BACKING PANELS
- A. Cementitious Backer Units: ANSI A108.11, at showers, tubs, and where indicated to receive tile.
- B. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.
- 3.6 INSTALLING TRIM ACCESSORIES
- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.
- C. Interior Trim: Install in the following locations:
1. Cornerbead: Use at outside corners, unless otherwise indicated.
 2. LC-Bead: Use at exposed panel edges.
 3. L-Bead: Use where indicated.
 4. Curved-Edge Cornerbead: Use at curved openings.
- D. Aluminum Trim: Install in locations indicated on Drawings.

3.7 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints, rounded or beveled edges, and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
 - 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
 - 2. Level 2: Panels that are substrate for acoustical tile where indicated on Drawings.
 - 3. Level 3: Where indicated on Drawings.
 - 4. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.
 - a. Primer and its application to surfaces are specified in Section 09 91 00 "Painting."
 - 5. Level 5: Where indicated on Drawings.
 - a. Primer and its application to surfaces are specified in Section 09 91 00 "Painting."
- E. Glass-Mat Gypsum Sheathing Board: Finish according to manufacturer's written instructions for use as exposed soffit board.
- F. Glass-Mat Faced Panels: Finish according to manufacturer's written instructions.
- G. Cementitious Backer Units: Finish according to manufacturer's written instructions.

3.8 PROTECTION

- A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION

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SECTION 09 30 00 - TILING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Interior tile (CT 1, CT 2, and CT 3).
 - 2. Waterproof and crack isolation membrane.
 - 3. Uncoupling membrane.
 - 4. Metal edge strips.
- B. Related Requirements:
 - 1. Section 07 92 00 "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.
 - 2. Section 09 29 00 "Gypsum Board" for cementitious backer units.

1.3 DEFINITIONS

- A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.
- B. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17, which are contained in its "Specifications for Installation of Ceramic Tile."
- C. Module Size: Actual tile size plus joint width indicated.
- D. Face Size: Actual tile size, excluding spacer lugs.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

1.5 SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples for Initial Selection: For tile, grout, and accessories involving color selection.
- C. Samples for Verification:
 - 1. Full-size units of each type and composition of tile and for each color and finish required. For ceramic mosaic tile in color blend patterns, provide full sheets of each color blend.

2. Assembled samples mounted on a rigid panel, with grouted joints, for each type and composition of tile and for each color and finish required. Make samples at least 12 inches square, but not fewer than four tiles. Use grout of type and in color or colors approved for completed Work.
3. Full-size units of each type of trim and accessory for each color and finish required.
4. Stone thresholds in 6-inch lengths.
5. Metal edge strips in 6-inch lengths.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.
 2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications:
 1. Installer is a five-star member of the National Tile Contractors Association or a Trowel of Excellence member of the Tile Contractors' Association of America.
 2. Installer's supervisor for Project holds the International Masonry Institute's Foreman Certification.
 3. Installer employs Ceramic Tile Education Foundation Certified Installers or installers recognized by the U.S. Department of Labor as Journeyman Tile Layers.
- B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 1. Build mockup of each type of floor tile installation.
 2. Build mockup of each type of wall tile installation.
 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.
- B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.
- D. Store liquid materials in unopened containers and protected from freezing.

1.9 FIELD CONDITIONS

- A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
 - 1. Provide tile complying with Standard grade requirements unless otherwise indicated.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.
- C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.
- D. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.

2.2 TILE PRODUCTS

- A. CT 1:
 - 1. Basis-of-Design Product: Clay41 by Stone Source; www.stonesource.com.
 - 2. Size: 3 x 16 inches.
 - 3. Color: "White Natural".
 - 4. Installation Pattern: Stacked.
 - 5. Grout: Ardex Americas; www.ardexamericas.com.
 - a. Color: "Asparagus 33".
- B. CT 2:
 - 1. Basis-of-Design Product: Oliva, Matte Collection by Stone Source; www.stonesource.com.
 - 2. Size: 8 x 8 inches.
 - 3. Color: "Oliva".
 - 4. Finish: "Natural".
 - 5. Grout Width and Color: As selected by Architect.
- C. CT 3:
 - 1. Basis-of-Design Product: Grace by Bedrosians Tile & Stone; www.bedrosians.com.
 - 2. Product No.: DOLGRAMO412.
 - 3. Size: 4 x 12 inches.
 - 4. Color: "Moka".
 - 5. Installation Pattern: Stacking bond.
 - 6. Grout Width and Color: As selected by Architect.

2.3 TILE BACKING PANELS

- A. Refer to Section 09 29 00 "Gypsum Board" for interior applications.

2.4 WATERPROOF MEMBRANE

- A. General: Manufacturer's standard product, selected from the following, that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
- B. Sheet Membrane: Polyethylene faced on both sides with non-woven polypropylene; compatible with liquid rubber polymer waterproofing.
 - 1. Nominal Thickness: 0.050 to 0.070inch .
 - 2. Basis-of-Design Products:
 - a. Hydro Ban Sheet Membrane by Laticrete International, Inc.; www.laticrete.com.
 - b. Kerdi 200 by Schluter Systems L.P.; www.schluter.com.
- C. Fluid-Applied Tiling Membrane: Single component self-curing liquid rubber polymer; compatible with polyethylene-polypropylene sheet waterproofing.
 - 1. Wet coat thickness: 15 to 22 mils (0.4 to 0.6 mm)
 - 2. Thickness (Dried): 20 to 30 mils (0.5 to 0.8 mm).
 - 3. Basis-of-Design Product: Hydro Ban by Laticrete International, Inc.; www.laticrete.com.
- D. Waterproofing and Crack Isolation Accessories: Utilize manufacturer's standard tapes, bands, corners and recommended adhesives to provide a complete and warrantable system.

2.5 SETTING MATERIALS

- A. Modified Dry-Set Mortar (Thinset): ANSI A118.4.
 - 1. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4.
- B. Improved Modified Dry-Set Mortar (Thinset): ANSI A118.15.
 - 1. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.15.

2.6 GROUT MATERIALS

- A. Sand-Portland Cement Grout: ANSI A108.10, consisting of white or gray cement and white or colored aggregate as required to produce color indicated.
- B. Standard Cement Grout: ANSI A118.6.
- C. High-Performance Tile Grout: ANSI A118.7.

2.7 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.
- B. Vapor-Retarder Membrane:
 - 1. At shower and bath tub surrounds: Provide waterproofing and crack isolation membrane.
 - 2. At restrooms, bathrooms and locker rooms, except shower and bath tub surrounds: Polyethylene sheeting, ASTM D 4397, 10.0 mils thick, unless otherwise indicated.
- C. Metal Edge Strips: Angle or L-shaped, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for tiling applications; exposed-edge material.

1. Basis-of-Design Products:
 - a. At Corners of Tile: Provide Quadec by Schluter Systems L.P.; www.schluter.com.
 - b. At Tops and Edges of Tile: Provide Jolly by Schluter Systems.
 - c. Colors: As selected by Architect.
 - D. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.
- 2.8 MIXING MORTARS AND GROUT
- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
 - B. Add materials, water, and additives in accurate proportions.
 - C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
 2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
 3. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot toward drains.
- B. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 CERAMIC TILE INSTALLATION

- A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.

- B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.
- E. Where accent tile differs in thickness from field tile, vary setting-bed thickness so that tiles are flush.
- F. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
 - 1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
 - 2. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
 - 3. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.
- G. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
 - 1. Ceramic Mosaic Tile: As selected by Architect.
 - 2. Glazed Wall Tile: As selected by Architect.
 - 3. Porcelain Tile: As selected by Architect.
- H. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.
- I. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
 - 1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.
- J. Stone Thresholds: Install stone thresholds in same type of setting bed as adjacent floor unless otherwise indicated.
- K. Metal Edge Strips: Install [at locations indicated] [where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with top of tile] [where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with or below top of tile and no threshold is indicated].
- L. Floor Sealer: Apply floor sealer to cementitious grout joints in tile floors according to floor-sealer manufacturer's written instructions. As soon as floor sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

3.4 WATERPROOFING INSTALLATION

- A. Install waterproofing to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness that is bonded securely to substrate.
- B. Allow waterproofing to cure and verify by testing that it is watertight before installing tile or setting materials over it.

3.5 CRACK ISOLATION MEMBRANE INSTALLATION

- A. Install crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness that is bonded securely to substrate.
- B. Allow crack isolation membrane to cure before installing tile or setting materials over it.

3.6 ADJUSTING AND CLEANING

- A. Remove and replace tile that is damaged or that does not match adjoining tile. Provide new matching units, installed as specified and in a manner to eliminate evidence of replacement.
- B. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
 - 1. Remove grout residue from tile as soon as possible.
 - 2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

3.7 PROTECTION

- A. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.
- B. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

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SECTION 09 51 13 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Acoustical panels and suspension systems.
 - 2. Trim and miscellaneous accessories.
 - 3. Delegated design.
- B. Related Requirements:
 - 1. Section 01 61 16 "Delegated Design Requirements".
 - 2. Division 21 "Fire Suppression" Sections for coordination with fire suppression sprinklers.
 - 3. Division 23 "Heating, Ventilating and Air Conditioning" Sections for coordination with air diffusers and returns in ceiling.
 - 4. Division 26 "Electrical" Sections for coordination with lighting fixtures in ceiling.
 - 5. Division 27 "Communications" Sections for coordination with audio-visual components in ceiling.
 - 6. Division 28 "Electronic Safety and Security" Sections for coordination with Fire Detection and Alarm System.

1.3 DEFINITIONS

- A. AC: Articulation Class.
- B. CAC: Ceiling Attenuation Class.
- C. LR: Light Reflectance Coefficient.
- D. NRC: Noise Reduction Coefficient.
 - 1. Coordinate paragraph below with qualification requirements in Division 01 Section "Contractor's Quality Control."

1.4 SUBMITTALS

- A. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- B. Delegated-Design Submittal: For ceilings indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

- C. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.
 - 1. Acoustical Panel: Set of samples of each type, color, pattern, and texture. Submit full-size for most panel types; submit partial panel sample may be submitted for 24- by 24-inch for larger panels.
 - 2. Exposed Suspension System Members, Moldings, and Trim: Set of 12-inch-long Samples of each type, finish, and color.

- D. Maintenance Data: For finishes to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Acoustical Ceiling Panels: Full-size panels equal to 2 percent of quantity of each type installed.
 - 2. Suspension-System Components: Quantity of each exposed component equal to 2 percent of quantity installed.
 - 3. Hold-Down Clips: Equal to 2 percent of quantity installed.
 - 4. Impact Clips: Equal to 2 percent of quantity installed.

1.6 QUALITY ASSURANCE

- A. Acoustical Testing Agency Qualifications: An independent testing laboratory, or an NVLAP-accredited laboratory, with the experience and capability to conduct the testing indicated. NVLAP-accredited laboratories must document accreditation, based on a "Certificate of Accreditation" and a "Scope of Accreditation" listing the test methods specified.
- B. Source Limitations:
 - 1. Acoustical Ceiling Panel: Obtain each type through one source from a single manufacturer.
 - 2. Suspension System: Obtain each type through one source from a single manufacturer.
- C. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Contractor's Quality Control."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical panels to avoid soiling exposed surfaces or damaging surfaces and edges.

1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
 - 1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical panel ceiling installation.

- B. Sequence work to assure that acoustical ceilings are not installed until building is enclosed, permanent heating system is available, dust generating activities have terminated, wet work is complete and dry, and work above ceilings is complete.
- C. Maintain temperature within 15 deg F and relative humidity within 10 percent of design conditions for spaces of installation not less than 48 hours before installation begins and thereafter.

1.9 COORDINATION

- A. Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.10 WARRANTY

- A. See Section 01 78 00 "Closeout Submittals", for additional warranty requirements.
- B. Provide manufacturer's standard written 30-year limited warranty for acoustical panels and suspension grid.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Manufacturer: Armstrong; www.armstrongceilings.com.

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 61 16 "Delegated Design Requirements," to design suspension systems.
- B. Seismic Standard: Provide acoustical panel ceilings conforming to the requirements of Chapter 16 of the Oregon Structural Specialty Code, and designed and installed to withstand the effects of earthquake motions for Seismic Design Category "D", according to the following:
 - 1. ASCE 7, "Minimum Design Loads for Buildings and Other Structures", Section 13.5.6 Suspended Ceilings.
 - 2. ASTM C635/C635M, "Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels".
 - 3. ASTM C636/C636M, "Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings".
 - 4. ASTM E580/E580M, "Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions".
- C. Fire-Test-Response Characteristics: Provide acoustical panel ceilings that comply with the following requirements:
 - 1. Fire-Resistance Characteristics: Where indicated, provide acoustical panel ceilings identical to those of assemblies tested for fire resistance according to one of the following standards, or another testing and inspecting agency acceptable to authorities having jurisdiction:
 - a. ASTM E119 "Test Methods for Fire Tests of Building Construction and Materials."
 - b. Underwriters Laboratory (UL) "Fire Resistance Directory."
 - 2. Identify materials with appropriate markings of applicable testing and inspecting agency.

3. Surface-Burning Characteristics: Provide acoustical panels with the following surface-burning characteristics complying with one of the following:
 - a. ASTM E1264 "Standard Classification for Acoustical Ceiling Products" for Class A materials as determined by testing identical products per ASTM E84 "Standard Test Method for Surface Burning Characteristics of Building Materials":
 - 1) Smoke-Developed Index: 450 or less.

D. Acoustic Performance: Refer to Acoustic Performance at individual Product articles below

2.3 ACOUSTICAL PANELS, GENERAL

- A. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with classifications as designated by types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated. Comply with one of the following standards:
 1. ASTM E1264 "Standard Classification for Acoustical Ceiling Products."
 - a. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 16 inches away from test surface per ASTM E795 "Standard Practice for Mounting Test Specimens During Sound Absorption Tests."
- B. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.
 1. Appearance characteristics of acoustical panels are indicated by referencing designations of ASTM E1264 "Standard Classification for Acoustical Ceiling Products." Provide products selected by Architect from manufacturer's full range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail and size. Products that do not list ASTM E1264 characteristics shall be tested by the product manufacturer's laboratory and shall meet comparable ASTM E1264 standards for country of origin.
- C. Coating-Based Antimicrobial Treatment: Provide acoustical panels with face and back surfaces coated with antimicrobial treatment consisting of manufacturer's standard formulation with fungicide added to inhibit growth of mold and mildew and showing no mold or mildew growth when tested according to one of the following standards:
 1. ASTM D3273 "Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber."

2.4 ACOUSTICAL PANEL CEILINGS

- A. Acoustical Panel Standard: Provide manufacturer's standard panels according to ASTM E1264 and designated by type, form, pattern, acoustical rating, and light reflectance unless otherwise indicated.
- B. Basis-of-Design Product: Ultima Lay-In and Tegular by Armstrong.

2.5 METAL SUSPENSION SYSTEMS, GENERAL

- A. Recycled Content: Not less than 70 percent.
- B. Suspension and Trim System:
 1. Basis-of-Design Product: As selected by Architect.
- C. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements of one of the following standards:
 1. ASTM C635 "Standard Specification for the Manufacture, Performance and Testing of Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings."

- D. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.
1. High-Humidity Finish: Comply with one of the following standards:
 - a. ASTM C635 requirements for "Coating Classification for Severe Environment Performance" where high-humidity finishes are indicated.
- E. Attachment Devices: Size for five times the design load indicated in one of the following:
1. ASTM C635, Table 1, "Direct Hung," unless otherwise indicated.
 - a. Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing per ASTM E488 "Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements" or ASTM E1512 "Standard Test methods for Testing Bond Performance of Bonded Anchors" as applicable, conducted by a qualified testing and inspecting agency.
 - b. Type: Cast-in-place anchors.
 - c. Type: Post-installed expansion anchors.
 - d. Corrosion Protection: Stainless-steel components complying with ASTM F593 "Standard Specification for Stainless Steel Bolts, Hex, Cap Screws and Studs" and ASTM F594 "Standard Specification for Stainless Steel Nuts" or ISO 3506-2:1997 "Mechanical Properties of Corrosion-Resistant Stainless-Steel Fasteners-Nuts." Group 1 alloy 304 or 316 for bolts; alloy 304 or 316 for anchor.
 2. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated, and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing per ASTM E1190 "Standard Test Methods for Strength of Power-Actuated Fasteners Installed in Structural Members", conducted by a qualified testing and inspecting agency.
- F. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
1. Zinc-Coated Carbon-Steel Wire: Comply with one of the following:
 - a. ASTM A641/A641M, "Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire", Class 1 zinc coating, soft temper.
 2. Size: Select wire diameter so its stress at three times hanger design load (ASTM C635, Table 1, "Direct Hung") will be less than yield stress of wire but, provide not less than 12-gauge, 0.08-inch- (2.03-mm-) diameter wire.
- G. Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.
- H. Angle Hangers: Angles with legs not less than 7/8-inch wide; formed with 0.04 inch- (1-mm-) thick, galvanized steel sheet complying with coating designation from one of the following standards; Provide bolted connections and 5/16-inch diameter bolts.
1. ASTM A653/A653M "Standard specification for Sheet Steel, zinc-Coated (Galvanized) or Zinc Iron Alloy-Coated (Galvannealed) by the Hot Dip Process"; Z275.
- I. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.
- J. Seismic Clips: Manufacturer's standard seismic clips designed and spaced to secure acoustical panels in-place.

- K. Hold-Down Clips: Where indicated, provide manufacturer's standard hold-down clips spaced 24 inches on center on all cross tees.
- L. Impact Clips: Where indicated, provide manufacturer's standard impact-clip system designed to absorb impact forces against acoustical panels.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION, GENERAL

- A. General: Install acoustical panel ceilings to comply with one of the following:
 - 1. ASTM C636 "Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels" and seismic requirements indicated, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
- B. Suspend ceiling hangers from building's structural members and as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 - 2. Splay hangers only where required and, if permitted with fire-resistance-rated ceilings, to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
 - 4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
 - 5. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, post-installed mechanical, or power-actuated fasteners that extend through forms into concrete.
 - 6. Space hangers not more than 48 inches on center along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
- C. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

- D. Install acoustical panels with undamaged edges and fit accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
 - 1. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension system runners and moldings.
 - 2. For reveal-edged panels on suspension system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
 - 3. For reveal-edged panels on suspension system members with box-shaped flanges, install panels with reveal surfaces in firm contact with suspension system surfaces and panel faces flush with bottom face of runners.
 - 4. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
 - 5. Install hold-down clips in areas indicated, in areas required by authorities having jurisdiction, and for fire-resistance ratings; space as recommended by panel manufacturer's written instructions, unless otherwise indicated.
 - 6. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified independent testing and inspecting agency to perform field tests and inspections and to prepare test reports.
- B. Testing Services: Testing and inspecting of completed installations of acoustical panel ceiling hangers shall take place in successive stages, in areas of extent and using methods as follows. Do not proceed with installations of acoustical panel ceiling hangers for the next area until test results for previously completed installations of acoustical panel ceiling hangers show compliance with requirements.
- C. Extent of Each Test Area: When installation of ceiling suspension systems on each floor has reached 20 percent completion but no panels have been installed.
 - 1. Within each test area, testing agency will select 1 of every 10 power-actuated fasteners and post-installed anchors used to attach hangers to concrete and will test them for 890 N of tension; it will also select one of every 2 post-installed anchors used to attach bracing wires to concrete and will test them for 1957 N of tension.
 - 2. When testing discovers fasteners and anchors that do not comply with requirements, testing agency will test those anchors not previously tested until 20 pass consecutively and then, will resume initial testing frequency.
- D. Remove and replace acoustical panel ceiling hangers where test results indicate that they do 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.

3.5 CLEANING

- A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

SECTION 09 65 00 - RESILIENT FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes resilient flooring:
 - 1. Luxury vinyl tile (LVT-#).
 - 2. Vinyl sheet flooring (SV-#).
- B. Related Requirements:
 - 1. Section 09 65 13 "Resilient Base and Accessories" for transitions strips used with flooring.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Submit shop drawings showing layout, finish colors, patterns and textures.
- C. Samples for Initial Selection: For moldings and accessories.
 - 1. For heat-welding bead, manufacturer's standard-size Samples, but not less than 9 inches long, of each color required.
- D. Samples for Verification: For each type of product and finish indicated, in manufacturer's standard-size Samples but not less than 12 inches long, of each resilient product color, texture, and pattern required.
- E. Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: Maintenance data for installed products in accordance with Division 01 sections. Include methods for maintaining installed products, and precautions against cleaning materials and methods detrimental to finishes and performance.
- B. Warranty: Warranty documents specified herein

1.5 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: Provide resilient accessories with a critical radiant flux classification of Class I, not less than 0.45 W/sq. cm, as determined by testing identical products per ASTM E 648 by a testing and inspecting agency acceptable to authorities having jurisdiction.
- B. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for resilient sheet flooring installation and seaming method indicated.
 - 1. Engage an installer who employs workers for this Project who are trained or certified by resilient flooring manufacturer for installation techniques required, including seaming method indicated.

- C. Mockups: Build mockups to verify selections and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Build mockups for resilient flooring including resilient base and accessories for typical installations and types indicated. Include flash cove base where applicable to installation.
 - 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.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

1.7 FIELD CONDITIONS

- A. Maintain temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive resilient materials during the following time periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.
- B. After post installation period, maintain temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Install resilient products after other finishing operations, including painting, have been completed.

1.8 SEQUENCING AND SCHEDULING

- A. Finishing Operations: Install flooring after finishing operations, including painting and ceiling operations etc., have been completed.

1.9 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace units and components that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Not less than five (5) years from Date of Substantial Completion for each flooring.
- B. Limited Wear Warranty: Manufacturer's limited wear warranty of 15 years for heavy commercial traffic.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For resilient sheet flooring, as determined by testing identical products according to ASTM E648 or NFPA 253 by a qualified testing agency.
 - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

2.2 RESILIENT FLOORING

- A. Tile Standard: Product standard for products indicated; ASTM F1066; Class 1, solid color; Class 2, through pattern; or Class 3, surface pattern.
- B. Sheet Flooring Standard: Product standard for products indicated; ASTM F1303.
- C. Vinyl Plank Flooring, LVT-#:
 - 1. Basis-of-Design Product: Advantage by Reward Flooring; www.rewardflooring.com.
 - a. Top Layer: 20 mil.
 - b. Color: As selected by Architect.
 - c. Size: 6 by 48 inches nominal.
 - 2. Installation Pattern: As indicated on Drawings.
 - 3. Underlayment: Manufacturer's recommended.
 - 4. Applications: As indicated on Drawings.
- D. Vinyl Sheet Flooring, SV-#:
 - 1. Basis-of-Design Product:
 - a. Corlon Heterogeneous Sheet by Armstrong Flooring; www.armstrongflooring.com.
 - b. City Hub by Mannington Commercial; div. of Mannington Mills, Inc.; www.manningtoncommercial.com.
 - 2. Thickness: As selected by Architect.
 - 3. Color: As selected by Architect.
 - 4. Installation Method: Glue down.
 - 5. Underlayment: Manufacturer's recommended.
 - 6. Applications: As indicated on Drawings.

2.3 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic cement-based formulation provided or approved by resilient product manufacturers for applications indicated.
- B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.
 - 1. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - a. Rubber Floor Adhesives: 60 g/L.
- C. Polish: Provide protective, liquid floor-polish products recommended by flooring manufacturer.
- D. Primer: As recommended by flooring and accessory manufacturer for substrate indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances, moisture content, and other conditions affecting performance.
 - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written recommendations to ensure adhesion of resilient products.
- B. Gypsum Underlayment Substrates: Prepare according to manufacturer's recommendations. Prime surfaces as required by adhesive manufacturer.
- C. Concrete Substrates: Prepare according to ASTM F710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with floor covering adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
 - 4. Moisture Testing: Perform tests recommended by manufacturer.
 - 5. Proceed with installation only after substrates pass testing.
 - 6. Provide vapor emission control and mitigation as required. See Section 01 3113 "Project Coordination."
- D. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
- E. Do not install floor coverings until they are same temperature as space where they are to be installed.
 - 1. Move floor coverings and installation materials into spaces where they will be installed at least 72 hours in advance of installation.
- F. Sweep and vacuum clean substrates to be covered by floor coverings immediately before installation.

3.3 INSTALLATION, GENERAL

- A. Comply with manufacturer's written instructions for installing floor coverings and products listed.
- B. Install underlayment following underlayment manufacturer's written instructions.
- C. Unroll resilient sheet flooring and allow it to stabilize before cutting and fitting.
- D. Lay out resilient sheet flooring as follows:
 - 1. Maintain uniformity of flooring direction.
 - 2. Minimize number of seams; place seams in inconspicuous and low-traffic areas, at least 6 inches away from parallel joints in flooring substrates.
 - 3. Match edges of flooring for color shading at seams.

4. Avoid cross seams.
 - E. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
 - F. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
 - G. Scribe and cut floor coverings to butt neatly and tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings.
 - H. Extend floor coverings into toe spaces, door reveals, closets, and similar openings.
 - I. Maintain reference markers, holes, or openings that are in place or marked for future cutting by repeating on floor coverings as marked on subfloor. Use chalk or other nonpermanent marking device.
 - J. Install floor coverings on covers for telephone and electrical ducts and similar items in finished floor areas. Maintain overall continuity of color and pattern between pieces of floor covering installed on covers and adjoining floor covering. Tightly adhere floor covering edges to substrates that abut covers and to cover perimeters.
 - K. Adhere floor coverings to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.
 - L. Integral-Flash-Cove Base: Cove resilient flooring to dimension indicated up vertical surfaces. Support flooring at horizontal and vertical junction with cove strip. Butt at top against cap strip as indicated. Top of base shall be level and not scribed to floor surfaces. Measure top of base from high point in floor for dimension indicated, unless directed otherwise and as reviewed during preconstruction meetings.
 1. Install metal corners at inside and outside corners where indicated. Heat weld where no metal trim is indicated.
 - M. Seamless Installation:
 1. Heat-Welded Seams: Comply with ASTM F1516. Rout joints and heat weld with welding bead to permanently fuse sections into a seamless flooring. Prepare, weld, and finish seams to produce surfaces flush with adjoining flooring surfaces.
- 3.4 CLEANING AND PROTECTION
- A. Perform the following operations immediately after completing resilient product installation:
 1. Remove adhesive and other blemishes from exposed surfaces.
 2. Sweep and vacuum surfaces thoroughly.
 3. Damp-mop surfaces to remove marks and soil.
 - a. Do not wash surfaces until after time period recommended by manufacturer.
 - B. Protect resilient products from marks, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods recommended in writing by manufacturer.
 - C. Floor Polish, Sheet and Tile Goods: Remove soil, adhesive, and blemishes from flooring surfaces before applying liquid floor polish.
 1. Apply three coats of finish where scheduled.
 - D. Replace damaged or installed units and accessories not complying with requirements.

- E. Cover resilient flooring until Substantial Completion.

END OF SECTION

SECTION 09 65 13 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Resilient base (RB 1 and RB 2).
 - 2. Resilient molding and installation accessories.

1.3 SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified, not less than 12 inches long.
- C. Samples for Initial Selection: For each type of product indicated.
- D. Samples for Verification: For each type of product indicated and for each color, texture, and pattern required in manufacturer's standard-size Samples, but not less than 12 inches long.
- E. Product Schedule: For resilient base and accessory products. Use same designations indicated on Drawings.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.5 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 - 1. Coordinate mockups in this Section with mockups specified in other Sections.
 - 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.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

1.7 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive resilient products during the following periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

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

2.2 RUBBER BASE

- A. Basis-of- Design Product, RB1: Roppe; www.roppe.com.
 - 1. Profiles: As selected by Architect.
 - 2. Heights: As selected by Architect.
 - 3. Color: As selected by Architect.
- B. Basis-of- Design Product, RB2: Pinnacle Rubber Base by Roppe; www.roppe.com.
 - 1. Profiles: As selected by Architect.
 - 2. Height: 6 inch.
 - 3. Color: As selected by Architect from Manufacturer's standard gray range.
 - 4. Application: Laundry Room at Community Building.

2.3 RESILIENT FLOORING ACCESSORIES

- A. Description: Transition strip for resilient floor coverings to carpet.
 - 1. Basis-of-Design Manufacturer: Schluter; www.schluter.com.
 - 2. Material: Metal.
 - 3. Profile and Dimensions: As indicated.

2.4 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.
 - 1. Adhesives shall have a VOC content of 50 g/L or less and 60 g/L or less for rubber stair treads.

- C. Stair-Tread Nose Filler: Two-part epoxy compound recommended by resilient stair-tread manufacturer to fill nosing substrates that do not conform to tread contours.
- D. Metal Edge Strips: Extruded aluminum with mill finish, nominal 2 inches wide, of height required to protect exposed edges of flooring, and in maximum available lengths to minimize running joints.
- E. Floor Polish: Provide protective, liquid floor-polish products recommended by resilient stair-tread manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
 - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
 - 1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates for Resilient Stair Accessories: Prepare horizontal surfaces according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 10 pH.
 - 4. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft., and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
 - a. Anhydrous Calcium Chloride Test: ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
 - b. Relative Humidity Test: Using in-situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install resilient products until materials are the same temperature as space where they are to be installed.
 - 1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.

- E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.3 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.
- F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

3.4 RESILIENT ACCESSORY INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient accessories.
- B. Resilient Stair Accessories:
 - 1. Use stair-tread-nose filler to fill nosing substrates that do not conform to tread contours.
 - 2. Tightly adhere to substrates throughout length of each piece.
 - 3. For treads installed as separate, equal-length units, install to produce a flush joint between units.

3.5 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.
- B. Perform the following operations immediately after completing resilient-product installation:
 - 1. Remove adhesive and other blemishes from surfaces.
 - 2. Sweep and vacuum horizontal surfaces thoroughly.
 - 3. Damp-mop horizontal surfaces to remove marks and soil.
- C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION

SECTION 09 68 00 - CARPETING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Carpet (CPT 2).
 - 2. Metal transition trim.
- B. Related Requirements:
 - 1. Section 09 65 13 "Resilient Base and Accessories" for resilient wall base and accessories installed with carpet.

1.3 SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
 - 2. Include manufacturer's written installation recommendations for each type of substrate.
- B. Shop Drawings: For carpet installation, plans showing the following:
 - 1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in laying carpet.
 - 2. Carpet type, color, and dye lot.
 - 3. Type of subfloor.
 - 4. Type of installation.
 - 5. Pattern of installation.
 - 6. Pattern type, location, and direction.
 - 7. Pile direction.
 - 8. Type, color, and location of insets and borders.
 - 9. Type, color, and location of edge, transition, and other accessory strips.
 - 10. Transition details to other flooring materials.
- C. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
 - 1. Carpet Tile: Full-size Sample.
 - 2. Exposed Edge, Transition, and Other Accessory Stripping: 12-inch- (300-mm-) long Samples.
- D. Samples for Initial Selection:
 - 1. Include Samples of exposed edge, transition, and other accessory stripping involving color or finish selection.

- E. Samples for Verification: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
 - 1. Exposed Edge, Transition, and Other Accessory Stripping: 12-inch- (300-mm-) long Samples.
- F. Product Schedule: For carpet. Use same designations indicated on Drawings.
- G. Qualification Data: For Installer.
- H. Product Test Reports: For carpet, for tests performed by a qualified testing agency.
- I. Sample Warranty: For special warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For carpet to include in maintenance manuals. Include the following:
 - 1. Methods for maintaining carpet, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
 - 2. Precautions for cleaning materials and methods that could be detrimental to carpet.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Carpet: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd. (8.3 sq. m).

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is certified by the International Certified Floorcovering Installers Association.
- B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
 - 1. Build mockups at locations and in sizes shown on Drawings or as selected by Architect.
 - 2. 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. Comply with CRI's "CRI Carpet Installation Standard."

1.8 FIELD CONDITIONS

- A. Comply with CRI's "CRI Carpet Installation Standard" for temperature, humidity, and ventilation limitations.
- B. Environmental Limitations: Do not deliver or install carpet until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at levels planned for building occupants during the remainder of the construction period.
- C. Do not install carpet over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet manufacturer.
- D. Where demountable partitions or other items are indicated for installation on top of carpet, install carpet before installing these items.

1.9 WARRANTY

- A. Special Warranty for Carpet: Manufacturer agrees to repair or replace components of carpet installation that fail in materials or workmanship within specified warranty period.
 - 1. Warranty does not include deterioration or failure of carpet due to unusual traffic, failure of substrate, vandalism, or abuse.
 - 2. Failures include, but are not limited to, the following:
 - a. More than 10 percent edge raveling, snags, and runs.
 - b. Dimensional instability.
 - c. Excess static discharge.
 - d. Loss of tuft-bind strength.
 - e. Loss of face fiber.
 - f. Delamination.
 - 3. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CARPET PRODUCTS,

- A. Carpet, CPT1:
 - 1. Basis-of-Design Product: Moraine Explorer by Milliken & Company;
www.floors.milliken.com.
 - a. Size: 50 cm by 1 m.
 - b. Color: No. EXR133-6-153 Origin w/ Black.
 - c. Installation Pattern: Monolithic, multi tile repeat.

2.2 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet manufacturer.
- B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that comply with flammability requirements for installed carpet, and are recommended by carpet manufacturer for releasable installation.
- C. Metal Edge/Transition Strips: Extruded aluminum with anodized finish of profile and width shown, of height required to protect exposed edge of carpet, and of maximum lengths to minimize running joints.
 - 1. At Carpet to Concrete: Provide Schluter-Schiene, Model no. AE 45 by Schluter Systems;
www.schluter.com.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet performance.
- B. Examine carpet for type, color, pattern, and potential defects.

- C. Concrete Slabs: Verify that finishes comply with requirements specified in Section 03 30 00 "Cast-in-Place Concrete" and that surfaces are free of cracks, ridges, depressions, scale, and foreign deposits.
 - 1. Moisture Testing: Perform tests so that each test area does not exceed 1000 sq. ft. (304.8 sq. m), and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
 - a. Anhydrous Calcium Chloride Test: ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
 - b. Relative Humidity Test: Using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
 - c. Perform additional moisture tests recommended in writing by adhesive and carpet manufacturers. Proceed with installation only after substrates pass testing.
 - d. Where necessary to reduce slab moisture for installation of carpet flooring, provide vapor emission control treatment acceptable to carpet manufacturer and compatible with products, and modify environmental conditions within acceptable range for specified Work and work sequence as required to maintain Project Schedule at no additional cost to the Owner.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with CRI's "Carpet Installation Standards" and with carpet manufacturer's written installation instructions for preparing substrates indicated to receive carpet.
- B. Concrete Substrates: Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by adhesive and carpet manufacturers.
 - 1. Grind high spots and fill low spots to produce a maximum 1/8-inch (3-mm) deviation in any direction when checked with a 10-foot (3-m) straight edge.
 - 2. Finished concrete floor shall comply with requirements specified in this Section and in Section 03 30 00 "Cast-in-Place Concrete". Contractor, at no cost to Owner, shall provide corrective measures required to comply with floor level and flatness within acceptable limits specified.
 - 3. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch (3 mm) wide or wider, and protrusions more than 1/32 inch (0.8 mm) unless more stringent requirements are required by manufacturer's written instructions.
- C. Broom and vacuum clean substrates to be covered immediately before installing carpet.

3.3 INSTALLATION

- A. General: Comply with CRI's "CRI Carpet Installation Standard," Section 18, "Modular Carpet" and with carpet manufacturer's written installation instructions.
- B. Installation Method: As recommended in writing by carpet manufacturer and indicated.
- C. Maintain dye-lot integrity. Do not mix dye lots in same area.

- D. Maintain pile-direction patterns indicated on Drawings and recommended in writing by carpet manufacturer.
- E. Cut and fit carpet to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet manufacturer.
- F. Extend carpet into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- G. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on carpet as marked on subfloor. Use nonpermanent, nonstaining marking device.
- H. Install pattern parallel to walls and borders.
- I. Access Flooring: Stagger joints of carpet tiles so carpet tile grid is offset from access flooring panel grid. Do not fill seams of access flooring panels with carpet adhesive; keep seams free of adhesive.

3.4 CLEANING AND PROTECTION

- A. Perform the following operations immediately after installing carpet:
 - 1. Remove excess adhesive and other surface blemishes using cleaner recommended by carpet manufacturer.
 - 2. Remove yarns that protrude from carpet surface.
 - 3. Vacuum carpet using commercial machine with face-beater element.
- B. Protect installed carpet to comply with CRI's "Carpet Installation Standard," Section 20, "Protecting Indoor Installations."
- C. Protect carpet against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet manufacturer.

END OF SECTION

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SECTION 09 72 00 - WALL COVERINGS

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. Wall covering with custom printed graphic image (WALL COV 1).
- B. Related Requirements:
 - 1. Section 09 91 00 "Painting" for preparation and priming of substrate surfaces.

1.3 SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include data on physical characteristics, durability, fade resistance, and fire-test-response characteristics.
- B. Shop Drawings: Show location and extent of each wall-covering type. Indicate pattern placement, seams and termination points.
- C. Samples: For each type of wall covering and for each color, pattern, texture, and finish specified, full width by 36-inch- (914-mm-) long in size.
 - 1. Graphic Wall Covering Sample: From same production run to be used for the Work, with specified treatments applied. Show complete pattern repeat. Mark top and face of fabric.
- D. Product Schedule: For graphic wall coverings. Use same designations indicated on Drawings.
- E. Maintenance Data: Submit data on cleaning, touch-up, and repair of covered surfaces.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this Section with minimum three (3) years of documented experience.
- B. Installer Qualifications: Company specializing in performing the type of Work specified in this Section with minimum five (5) years of experience.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Inspect roll materials at arrival on site, to verify acceptability.
- B. Protect packaged adhesive from temperature cycling and cold temperatures.
- C. Do not store roll goods on end.

1.6 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the adhesive or wall covering product manufacturer.
- B. Maintain these conditions 24 hours before, during, and after installation of adhesive and wall covering.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Wall Covering, WALL COV 1: Custom digitally printed wall graphic with protective overlayer.
 - 1. Basis-of-Design Products:
 - a. Image Layer: Controltac Graphic Film with Comply Adhesive by 3M; www.3m.com.
 - 1) Or approved equal.
 - b. Protective Overlayer: Scotchcal Matte Overlamine 8510M by 3M; www.3m.com.
 - 1) Or approved equal.
 - 2. Basis-of-Design Fabricator: Precision Images; www.precisionimages.com; contact Erica Bitterman-Ryon; ebitterman@precisionimages.com.
- B. Printing and Fabrication: All panels printed with 1- to 2-inch bleed on all edges and between panels. Provide overlap/double cut installation method.
 - 1. Provide custom image handling and rework for the image(s) desired for use in reproduction to wall covering.
 - 2. Provide proof approval via electronic version of wall covering design, followed by a physical proof (strikeoff) for final approval.
- C. Installation Requirements:
 - 1. Installation contractor shall be pre-qualified by the manufacturer.
 - 2. Printing/ fabrication and installation contractors shall understand the Project conditions prior to bidding.
 - 3. installation contractor shall survey Project site prior to installation to confirm installation method.
- D. Adhesive: Type recommended by wall covering manufacturer to suit application to substrate.
- E. Substrate Filler: As recommended by adhesive and wall covering manufacturers; compatible with substrate.
- F. Substrate Primer and Sealer: Alkyd enamel type.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that substrate surfaces are prime painted and ready to receive work and conform to requirements of the wall covering manufacturer.
- B. Measure moisture content of surfaces using an electronic moisture meter. Do not apply wall coverings if moisture content of substrate exceeds level recommended by wall covering manufacturer.
- C. Verify flatness tolerance of surfaces does not vary more than 1/8 inch in 10 feet nor vary at a rate greater than 1/16 inch/ft.

3.2 PREPARATION

- A. Fill cracks in substrate and smooth irregularities with filler; sand smooth.
- B. Wash impervious surfaces with tetra-sodium phosphate, rinse and neutralize; wipe dry.
- C. Surface Appurtenances: Remove electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.

- D. Surfaces: Correct defects and clean surfaces that affect Work of this Section. Remove existing coatings that exhibit loose surface defects.
- E. Marks: Seal with shellac those that may bleed through surface finishes.
- F. Apply one coat of primer sealer to substrate surfaces. Allow to dry. Lightly sand smooth.
- G. Vacuum clean surfaces free of loose particles.

3.3 INSTALLATION

- A. Apply adhesive and wall covering in accordance with manufacturer's instructions.
- B. Use wall covering in pattern sequence.
- C. Razor trim edges on flat work table. Do not razor cut on gypsum board surfaces.
- D. Apply wall covering smooth, without wrinkles, gaps or overlaps. Eliminate air pockets and ensure full bond to substrate surface. Butt edges tightly.
- E. Horizontal seams are not acceptable.
- F. Do not seam within 2 inches of internal corners or within 6 inches of external corners.
- G. Install wall covering before installation of bases and items attached to or spaced slightly from wall surface.
 - 1. Do not install wall covering more than 1/4 inch below top of resilient base.
- H. Cover spaces above and below windows, above doors, in pattern sequence from roll.
- I. Apply wall covering to electrical wall plates prior to replacing.
- J. Where wall covering tucks into reveals, or metal wallboard or plaster stops, apply with contact adhesive within 6 inches of wall covering termination. Ensure full contact bond.
- K. Remove excess adhesive while wet from seam before proceeding to next wall covering sheet. Wipe clean with dry cloth.

3.4 CLEANING

- A. Clean wall coverings of excess adhesive, dust, dirt, and other contaminants.
- B. Reinstall wall plates and accessories removed prior to Work of this Section.

3.5 PROTECTION

- A. Do not permit construction activities at or near finished wall covering areas.

END OF SECTION

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SECTION 09 72 12 - FIBERGLASS REINFORCED PLASTIC WALL COVERING

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. Fiberglass reinforced plastic wainscot panels (FRP-1).
 - 2. Moldings and accessories.
- B. Related Requirements:
 - 1. Section 07 92 00 "Joint Sealants".
 - 2. Section 09 29 00 "Gypsum Board" for panel substrate.

1.3 SUBMITTALS

- A. Product Data: For each type of fiberglass reinforced plastic wall covering and accessory.
- B. Shop Drawings: Show location and extend of each wall covering. Indicate seams and termination points.
 - 1. Include trim types and locations and section details.
- C. Samples for Initial Selection: For each type of fiberglass reinforced plastic wall covering and accessory
- D. Samples for Verification: For each type of wall covering and for each color, pattern, texture, and finish specified, 3 inches square in size.
- E. Product Schedule: For wall coverings. Use same designations indicated on Drawings.
- F. Qualification Data: For testing agency.
- G. Product Test Reports: For each wall covering, for tests performed by a qualified testing agency.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For wall coverings to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Applicator shall be experienced in manufacturer's installation procedures and be approved by the manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver finish materials to job site only when satisfactory conditions for storage can be provided. Maintain materials in manufacturer's labeled and unbroken packages.

1.7 PROJECT CONDITIONS

- A. Acclimate plastic sheet at least 24 hours in temperature and humidity conditions of final environment before beginning Work of this Section.

- B. Environmental Limitations: Do not deliver or install wall coverings until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at levels intended for occupants after Project completion during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: As determined by testing identical wall coverings applied with identical adhesives to substrates according to test method indicated below by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: 75 or less.
 - b. Smoke-Developed Index: 450 or less.

2.2 MANUFACTURERS

- A. Source Limitations: Obtain fiberglass reinforced plastic wall coverings and associated moldings from single source from single manufacturer for each type and finish indicated.

2.3 MATERIALS

- A. Fiberglass Reinforced Plastic Wainscot Panels: FRP-1:
 - 1. Basis-of-Design Product: Induro FRP by Marlite, div. of Nudo Products, Inc.; www.marlite.com.
 - 2. Fiberglass reinforced plastic sheet, 0.09-inch thick.
 - 3. Fire Hazard Classification: Class B, as tested per ASTM E84.
 - 4. Color: As selected by Architect.
 - 5. Finish: Smooth or as selected by Architect; standard for product indicated.
- B. Adhesive: Low VOC as recommended by plastic sheet manufacturer for laminating over gypsum board substrate.
- C. Sealant: Silicone sealant as recommended by plastic sheet manufacturer for sealing edges and installing moldings.
- D. Moldings: Comply with Sustainability Requirements.
 - 1. Material: As confirmed during sample submittals; PVC in matching color; aluminum in finish selected.
 - 2. Manufacturer: By panel manufacturer.
 - 3. Profiles: As selected by Architect for panel splices, inside and outside corners, bottom, top and edge of panel from manufacturer's standard profiles.
- E. Application: Wainscoting as indicated on Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

- A. Comply with manufacturer's written instructions for surface preparation.
- B. Clean substrates of substances that could impair bond of wall covering, including dirt, oil, grease, mold, mildew, and incompatible primers.
- C. Prepare substrates to achieve a smooth, dry, clean, structurally sound surface free of flaking, unsound coatings, cracks, and defects.
 - 1. Moisture Content: Maximum of 5 percent on new plaster, concrete, and concrete masonry units when tested with an electronic moisture meter.
 - 2. Plaster: Allow new plaster to cure. Neutralize areas of high alkalinity. Prime with primer recommended in writing by primer/sealer manufacturer and wall-covering manufacturer.
 - 3. Gypsum Board: Prime with primer as recommended in writing by primer/sealer manufacturer and wall-covering manufacturer.
 - 4. Painted Surfaces: Not permitted unless confirmed in writing by FRP manufacturer prior to commencement of work.
- D. Remove hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.
- E. Acclimatize wall-covering materials by removing them from packaging in the installation areas not less than 48 hours before installation.

3.3 INSTALLATION

- A. Apply adhesive in accordance with the recommendations of the adhesive manufacturer.
- B. Handle and install wall covering in conformance with manufacturer's installation bulletin.
- C. Install wall covering to provide a proper symmetrical pattern in each area, with joints straight and true, and all panel edges concealed with appropriate molding for finished appearance; joints sealed with silicone sealant.

3.4 CLEANING AND PROTECTION

- A. Carefully clean all surfaces after application using recommended methods. Any stains or defects apparent after cleaning will require replacement of material.
- B. Protect wall coverings from damage. Replace damage coverings.

END OF SECTION

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SECTION 09 91 00 - PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes surface preparation and field painting of exposed items and surfaces, except as indicated in the Related Requirements article below.
 - 1. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections. Substrates include:
 - a. Interior substrates:
 - 1) Gypsum wall and ceiling board.
 - 2) Wood.
 - 3) Hollow-metal work, factory-primed.
 - 4) Steel.
 - 2. Paint schedule for all finish colors in Project.
- B. Paint exposed surfaces, except where these Specifications indicate that the surface or material is not to be painted or is to remain natural. If an item or a surface is not specifically mentioned, paint the item or surface the same as similar adjacent materials or surfaces. If a color of finish is not indicated, Architect will select from standard colors and finishes available.
 - 1. Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron supports, and surfaces of mechanical and electrical equipment that do not have a factory-applied final finish.
- C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.
 - 1. Prefinished items include the following factory-finished components:
 - a. Architectural woodwork.
 - b. Unit kitchens.
 - c. Elevator equipment.
 - d. Finished mechanical and electrical equipment.
 - e. Light fixtures.
 - 2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:
 - a. Foundation spaces.
 - b. Furred areas.
 - c. Ceiling plenums.
 - d. Utility tunnels.
 - e. Pipe spaces.
 - f. Duct shafts.

- g. Elevator shafts.
 - 3. Finished metal surfaces include the following:
 - a. Anodized aluminum.
 - b. Stainless steel.
 - c. Chromium plate.
 - d. Copper and copper alloys.
 - e. Bronze and brass.
 - 4. Operating parts include moving parts of operating equipment and the following:
 - a. Valve and damper operators.
 - b. Linkages.
 - c. Sensing devices.
 - d. Motor and fan shafts.
 - 5. Labels: Do not paint over UL, FMG, or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.
- D. Products and materials in this Section have been selected for indoor chemical and pollutant source control and/ or low-VOC emitting characteristics.
- E. Related Requirements:
 - 1. Section 07 19 00 "Water Repellents" for exterior concrete sealers.
 - 2. Section 09 96 00 "High-Performance Coatings" for the following:
 - a. Exterior Substrates:
 - 1) Plain steel.
 - 2) Galvanized steel.
 - 3) Hollow-metal work, factory primed.

1.3 DEFINITIONS

- A. Volatile Organic Compounds (VOCs): Compounds as defined by the U.S. Environmental Protection Agency (EPA) in 40 CFR § 51.100 (s), (1).
- B. Anti-Corrosive Paints: Coatings formulated and recommended for use in preventing the corrosion of ferrous metal substrates.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Initial Selection: For each type of topcoat product indicated.
- C. Samples for Verification: For each type of paint system and in each color and gloss of topcoat indicated.
 - 1. Submit Samples on rigid backing, 8 inches square.
 - 2. Step coats on Samples to show each coat required for system.
 - 3. Label each coat of each Sample.
 - 4. Label each Sample for location and application area.

- D. Product List: For each product indicated, include the following:
 - 1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.

1.5 PROJECT CONDITIONS

- A. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F. Maintain storage containers in a clean condition, free of foreign materials and residue.
- B. Apply waterborne paints only when temperatures of surfaces to be painted and surrounding air are between 50 and 90 deg F.
- C. Apply solvent-thinned paints only when temperatures of surfaces to be painted and surrounding air are between 45 and 95 deg F.
- D. Do not apply paint in snow, rain, fog, or mist; or when relative humidity exceeds 85 percent; or at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Provide paint products by one of the following manufacturers:
 - 1. Benjamin Moore & Co.; www.benjaminmoore.com.
 - 2. Miller Paint; www.millerpaint.com.
 - 3. PPG Industries, Inc.; www.ppg.com.
 - 4. Rodda Paint Co.; www.roddapaint.com.
 - 5. Sherwin-Williams Co., The; www.sherwin-williams.com.

2.2 PAINT MATERIALS, GENERAL

- A. Material Compatibility: Provide block fillers, primers, and finish-coat materials that are compatible with one another and with the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
- B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application indicated. Paint-material containers not displaying manufacturer's product identification will not be acceptable.
- C. Chemical Components of Interior Paints and Coatings: Provide products that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24) and the following chemical restrictions.
 - 1. The following chemicals shall not be used as an ingredient in any of the paints or coatings applied indoors and on-site:
 - a. Aromatic Compounds: The product must contain no more than 1.0% by weight of the sum total of aromatic compounds.
 - b. Halomethanes: Methylene Chloride.
 - c. Chlorinated Ethanes: 1,1,1-trichloroethane.
 - d. Aromatic Solvents: Benzene, Toluene (methylbenzene), Ethylbenzene.
 - e. Chlorinated Ethylenes: Vinyl Chloride.
 - f. Polynuclear Aromatics: Naphthalene.

- g. Chlorobenzenes: 1,2-dichlorobenzene.
 - h. Phthalate Esters: di (2-ethylhexyl) phthalate, butyl benzyl phthalate, di-n-butyl phthalate, di-n-octyl phthalate, diethyl phthalate, dimethyl phthalate.
 - i. Miscellaneous Semi-Volatile Organics: Isophorone. Metals and their compounds: Antimony, Cadmium, Hexavalent Chromium, Lead, Mercury.
 - j. Preservatives (Anti-Fouling Agents): Formaldehyde.
 - k. Ketones: Methyl ethyl ketone, Methyl isobutyl Ketone.
 - l. Miscellaneous Volatile Organics: Acrolein, Acrylonitrile.
2. Volatile Organic Compounds: The volatile organic compound (VOC) concentrations (in grams per liter) of the paint or coating shall not exceed those listed below if the paint or coating is applied indoors, on-site. VOCs shall be tested in accordance with the U.S. Environmental Protection Agency (EPA) Test Method 24. The calculation of VOC shall exclude water, exempt solvents, and tinting color added at the point of sale.
- a. Flat Interior Coatings: 50 g/L.
 - b. Non-Flat Interior Coatings: 150 g/L.
 - c. Gloss Anti-Corrosive Interior Coatings: 250 g/L.
 - d. Semi-Gloss Anti-Corrosive Interior Coatings: 250 g/L.
 - e. Flat Anti-Corrosive Interior Coatings: 250 g/L.
 - f. Bond Breaker Coatings: 350 g/L.
 - g. Concrete Curing Compounds: 350 g/L.
 - h. Floor Coatings: 250 g/L.
 - i. Flow Coatings: 420 g/L.
 - j. Form Release Compounds: 250 g/L.
 - k. Pre-Treatment Wash Primers Coatings: 420 g/L.
 - l. Sanding Sealers (Non-Lacquer): 350 g/L.
 - m. Shellacs, Clear: 730 g/L.
 - n. Shellacs, Opaque: 550 g/L.
 - o. Specialty Primers, Sealers, and Undercoaters: 350 g/L.
 - p. Stains: 250 g/L.
 - q. Varnishes: 350 g/L.
 - r. Waterproofing Sealers: 250 g/L.
 - s. Waterproofing Sealers, Concrete/Masonry: 400 g/L.
 - t. Wood Preservatives: 350 g/L.

2.3 PREPARATORY COATS

- A. Concrete Unit Masonry Block Filler: High-performance latex block filler of finish coat manufacturer and recommended in writing by manufacturer for use with finish coat and on substrate indicated.
- B. Interior Primer: Interior latex-based or alkyd primer of finish coat manufacturer and recommended in writing by manufacturer for use with finish coat and on substrate indicated.
 - 1. Ferrous-Metal Substrates: Quick drying, rust-inhibitive metal primer.

2. Zinc-Coated Metal Substrates: Galvanized metal primer.
3. Where manufacturer does not recommend a separate primer formulation on substrate indicated, use paint specified for finish coat.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Comply with procedures specified in PDCA P4 for inspection and acceptance of surfaces to be painted.
- B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
- C. Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of size or weight of the item, provide surface-applied protection before surface preparation and painting.
 1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.
- D. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.
 1. Provide barrier coats over incompatible primers or remove and reprime.
 2. Cementitious Materials: Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.
 3. Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.
 - a. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer before applying primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.
 - b. Prime, stain, or seal wood to be painted immediately on delivery. Prime edges, ends, faces, undersides, and back sides of wood, including cabinets, counters, cases, and paneling.
 - c. If transparent finish is required, backprime with spar varnish.
 - d. Backprime paneling on interior partitions where masonry, plaster, or other wet wall construction occurs on back side.
 - e. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately on delivery.
 4. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with SSPC's recommendations.
 - a. Blast steel surfaces clean as recommended by paint system manufacturer and according to SSPC-SP 6/NACE No. 3, SSPC-SP 10/NACE No. 2.
 - b. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.

- c. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with same primer as the shop coat.
- 5. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.
- E. Material Preparation:
 - 1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
 - 2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
- F. Exposed Surfaces: Include areas visible when permanent or built-in fixtures, grilles, convector covers, covers for finned-tube radiation, and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.
 - 1. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 - 2. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
 - 3. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
 - 4. Finish interior of wall and base cabinets and similar field-finished casework to match exterior.
- G. Sand lightly between each succeeding enamel or varnish coat.
- H. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
 - 1. Omit primer over metal surfaces that have been shop primed and touchup painted.
 - 2. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance.
- I. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.
- J. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate. Provide total dry film thickness of the entire system as recommended by manufacturer.
- K. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and occupied spaces.
- L. Prime Coats: Before applying finish coats, apply a prime coat, as recommended by manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.
- M. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting,

holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

- N. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, runs, cloudiness, color irregularity, brush marks, orange peel, nail holes, or other surface imperfections.

3.2 CLEANING AND PROTECTING

- A. At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from Project site.
- B. Protect work of other trades, whether being painted or not, against damage from painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.
- C. Provide "Wet Paint" signs to protect newly painted finishes. After completing painting operations, remove temporary protective wrappings provided by others to protect their work.
 - 1. After work of other trades is complete, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

3.3 INTERIOR PAINT SYSTEM SCHEDULE

- A. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
 - 1. Paint the following work where exposed to view, with paint compatible with substrate:
 - a. Plywood backing.
 - b. Uninsulated metal piping.
 - c. Uninsulated plastic piping.
 - d. Pipe hangers and supports.
 - e. Metal conduit.
 - f. Plastic conduit.
 - g. Tanks that do not have factory-applied final finishes.
- B. Exposed Structure, Ceilings: Where scheduled to be painted.
 - 1. System: One coat modified acrylic dryfall.
 - 2. Verify substrate and acceptable product.
- C. Interior Steel Fabrications and Steel Doors and Frames (Factory primed):
 - 1. System: Two coats, water-based alkyd enamel finish.
 - 2. Sheen: Semi-gloss.
- D. Gypsum Board Substrates:
 - 1. Acrylic Latex System, institutional low odor/ VOC.
 - a. Prime/Sealer Coat: Latex, interior.
 - b. Intermediate Coat: Latex, interior, matching topcoat.
 - c. Topcoat: Latex, interior.
 - 2. Sheen:
 - a. Walls: Eggshell.
 - b. Ceilings: Flat.

- E. Gypsum Board Substrates: Moisture-resistant finish; At janitor, mechanical, restrooms and toilet rooms:
 - 1. System:
 - a. Prime Coat: Acrylic, interior.
 - b. Intermediate Coat: Match topcoat.
 - c. Topcoat: Waterborne epoxy coating, interior.
 - 2. Sheen:
 - a. Walls: Semi-gloss.
 - b. Ceilings: Flat.
- F. Wood Substrates:
 - 1. Latex over Latex Primer System:
 - a. Prime Coat: Primer, latex, for interior wood.
 - b. Intermediate Coat: Latex, interior, matching topcoat.
 - c. Topcoat: Latex, interior.
 - 2. Sheen: Semi-gloss.

3.4 COLOR SCHEDULE

- A. Refer to Drawings for color schedule.
- B. Coordinate finish colors with systems indicated in other Sections.
- C. Basis-of-Design Manufacturer is for color only. Provide color match where different paint manufacturer is used.
- D. Where surfaces are scheduled for primer only, provide primer indicated for substrate in systems listed above.

END OF SECTION

SECTION 09 96 00 - HIGH-PERFORMANCE COATINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes surface preparation and field application of high-performance coating systems.
 - 1. Section includes surface preparation and the application of high-performance coating systems on the following substrates:
 - a. Exterior Substrates:
 - 1) Cast-in-place concrete, vertical surfaces, for graffiti- and stain-resistant finish.
 - 2) Glazed brick, vertical surfaces.
 - 3) Non-galvanized, unprimed steel and hollow-metal work.
 - 4) Aluminum (not anodized or otherwise coated).
 - 5) Preservative-treated wood.
 - b. Interior Substrates:
 - 1) Non-galvanized, unprimed steel and hollow-metal work.
 - 2) Aluminum (not anodized or otherwise coated).
 - 3) Gypsum board.
 - 4) Wood.
- B. Products and materials in this Section have been selected for indoor chemical and pollutant source control and/ or low-VOC emitting characteristics.
- C. Related Requirements:
 - 1. Section 09 91 00 "Painting" for surface preparation and field painting of exposed interior and exterior items and surfaces, except as indicated in the Summary articles of this Section.
- D. Paint exposed surfaces, except where these Specifications indicate that the surface or material is not to be painted or is to remain natural. If an item or a surface is not specifically mentioned, paint the item or surface as selected by Architect. If a color of finish is not indicated, Architect will select from standard colors and finishes available.
 - 1. Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron supports, and surfaces of mechanical and electrical equipment that do not have a factory-applied final finish.
- E. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.
 - 1. Prefinished items include the following factory- and shop-finished components:
 - a. Finish carpentry.
 - b. Architectural casework.

- c. Mechanical and electrical equipment.
 - d. Lighting fixtures.
- 2. Prefinished metal surfaces include the following:
 - a. Anodized aluminum.
 - b. Stainless steel.
 - c. Chromium plate.
 - d. Copper and copper alloys.
 - e. Bronze and brass.
- 3. Operating parts include moving parts of operating equipment and the following:
 - a. Valve and damper operators.
 - b. Linkages.
 - c. Sensing devices.
 - d. Motor and fan shafts.
- 4. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:
 - a. Furred areas.
 - b. Ceiling plenums.
 - c. Piping spaces.
 - d. Duct shafts.
- 5. Labels: Do not paint over UL, FMG, or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.
- F. Products and materials in this Section have been selected for indoor chemical and pollutant source control and/ or low-VOC emitting characteristics.

1.3 DEFINITIONS

- A. Volatile Organic Compounds (VOCs): Compounds as defined by the U.S. Environmental Protection Agency (EPA) in 40 CFR § 51.100 (s), (1).
- B. Anti-Corrosive Paints: Coatings formulated and recommended for use in preventing the corrosion of ferrous metal substrates.
- C. Standard coating terms defined in ASTM D 16 apply to this Section.
- D. Gloss ranges used in this Section include the following:
 - 1. Semigloss refers to medium-sheen finish with a gloss range between 30 and 65 when measured at a 60-degree meter.
 - 2. High gloss refers to high-sheen finish with a gloss range more than 65 when measured at a 60-degree meter.
- E. Environments: The following terms are used in Part 2 of this Section to distinguish between different corrosive exposures:
 - 1. "Severe environments" are highly corrosive industrial atmospheres with sustained exposure to high humidity and condensation and with frequent cleaning using strong chemicals. Environments with heavy concentrations of strong chemical fumes and frequent splashing and spilling of harsh chemical products are severe environments.

2. "Moderate environments" are corrosive industrial atmospheres with intermittent exposure to high humidity and condensation, occasional mold and mildew development, and regular cleaning with strong chemicals. Environments with exposure to heavy concentrations of chemical fumes and occasional splashing and spilling of chemical products are moderate environments.
3. "Mild environments" are industrial atmospheres with normal exposure to moderate humidity and condensation, occasional mold and mildew development, and infrequent cleaning with strong chemicals. Environments with low levels of mild chemical fumes and occasional splashing and spilling of chemical products are mild environments. Normal outdoor weathering is also considered a mild environment.

1.4 SEQUENCING AND SCHEDULING

- A. Perform maintenance repainting in the following sequence, which includes work specified in this and other Sections:
 1. Dismantle existing surface-mounted objects and hardware except items indicated to remain in place. Tag items with location identification and protect.
 2. Verify that temporary protections have been installed.
 3. Examine condition of surfaces to be painted.
 4. Remove existing paint to the degree required for each substrate and surface condition of existing paint.
 5. Apply paint system.
 6. Reinstall dismantled surface-mounted objects and hardware unless otherwise indicated.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Initial Selection: For each type of finish-coat product indicated.
- C. Samples for Verification: For each type of coating system and in each color and gloss of finish coat indicated.
 1. Submit Samples on rigid backing, 8 inches (200 mm) square.
 2. Step coats on Samples to show each coat required for system.
 3. Label each coat of each Sample.
 4. Label each Sample for location and application area.
- D. Product List: For each product indicated, include the following:
 1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
 2. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Paint: 5 percent, but not less than 1 gal. of each material and color applied.

1.7 QUALITY ASSURANCE

- A. All materials, preparation and painting Work shall comply with the requirements of the latest edition of the Architectural Painting Specification Manual by the Master Painters Institute (MPI).
 - 1. All paint manufacturers and products shall be listed under the Approved Product List section of the MPI Painting Manual.
- B. Color Matching: Custom computer-match paint colors to colors scheduled.
- C. Applicator Qualifications: Engage an experienced applicator who has completed high-performance coating system applications similar in material and extent to those indicated for Project and whose work has a record of successful in-service performance.
- D. Source Limitations: Obtain primers and undercoat materials for each coating system from the same manufacturer as the finish coats.
- E. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Architect will select one surface to represent surfaces and conditions for application of each paint system.
 - a. Vertical and Horizontal Surfaces: Provide samples of at least (9 sq. m).
 - b. Other Items: Architect will designate items or areas required.
 - 2. Final approval of color selections will be based on mockups.
 - a. Provide a maximum of three additional mockups at no additional cost.
 - 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.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label with the following information:
 - 1. Name or title of material.
 - 2. Product description (generic classification or binder type).
 - 3. Manufacturer's stock number and date of manufacture.
 - 4. Contents by volume, for pigment and vehicle constituents.
 - 5. Thinning instructions.
 - 6. Application instructions.
 - 7. Color name and number.
 - 8. Handling instructions and precautions.
- B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 7 deg C. Maintain containers used in storage in a clean condition, free of foreign materials and residue.
 - 1. Protect materials from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are

protected from fire and health hazards resulting from handling, mixing, and applying coatings.

1.9 PROJECT CONDITIONS

A. Exterior:

1. Apply paints, including waterborne paints, only when temperature of surfaces to be painted and ambient air temperatures are between (10 and 35 deg C).
2. Apply solvent-thinned paints only when temperatures of surfaces to be painted and surrounding air are between 45 and 95 deg F (7 and 35 deg C).
3. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than (3 deg C) above the dew point; or to damp or wet surfaces.
 - a. Allow wet surfaces to dry thoroughly and attain temperature and conditions specified before proceeding with or continuing coating operation.
 - b. Work may continue during inclement weather only if areas and surfaces to be coated are enclosed and temperature within the area can be maintained within limits specified by manufacturer during application and drying periods.

B. Interior:

1. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).
2. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than (3 deg C) above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Interior Paints: Emissions testing must comply with California Department of Public Health (CDPH) Standard Method v1.1-2010.
- B. VOC limits shall comply with Section 01 81 13 "Sustainability Requirements" required for adhesives, sealants, paints, coatings, flooring, interior wall systems, thermal insulation, acoustic insulation, composite wood materials and laminating adhesives used to fabricate wood assemblies installed inside of the building's moisture barrier as applicable to Work of this Section.

2.2 COATINGS MATERIALS, GENERAL

- A. MPI Standards: Products shall comply with MPI standards indicated, including gloss levels, and shall be listed in its "MPI Approved Products Lists."
- B. Material Compatibility: Provide block fillers, primers, and finish-coat materials that are compatible with one another and with the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
 1. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- C. Epoxy resin coatings shall be used where surfaces to be coated require high corrosion resistance, chemical resistance, bond strength, UV resistance and toughness.
- D. Polyurethane-base coatings shall be used where surfaces to be coated require high corrosion resistance, chemical resistance, good flexibility and chemical resistance, UV resistance, and must be a two-part, prepolymer, catalytic-cured resin material.
- E. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application indicated.

Paint-material containers not displaying manufacturer's product identification will not be acceptable.

- F. Chemical Components of Interior Paints and Coatings: Provide products that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24) and the following chemical restrictions.
1. The following chemicals shall not be used as an ingredient in any of the paints or coatings applied indoors and on-site:
 - a. Aromatic Compounds: The product must contain no more than 1.0% by weight of the sum total of aromatic compounds.
 - b. Halomethanes: Methylene Chloride.
 - c. Chlorinated Ethanes: 1,1,1-trichloroethane.
 - d. Aromatic Solvents: Benzene, Toluene (methylbenzene), Ethylbenzene.
 - e. Chlorinated Ethylenes: Vinyl Chloride.
 - f. Polynuclear Aromatics: Naphthalene.
 - g. Chlorobenzenes: 1,2-dichlorobenzene.
 - h. Phthalate Esters: di (2-ethylhexyl) phthalate, butyl benzyl phthalate, di-n-butyl phthalate, di-n-octyl phthalate, diethyl phthalate, dimethyl phthalate.
 - i. Miscellaneous Semi-Volatile Organics: Isophorone. Metals and their compounds: Antimony, Cadmium, Hexavalent Chromium, Lead, Mercury.
 - j. Preservatives (Anti-Fouling Agents): Formaldehyde.
 - k. Ketones: Methyl ethyl ketone, Methyl isobutyl Ketone.
 - l. Miscellaneous Volatile Organics: Acrolein, Acrylonitrile.
 2. Volatile Organic Compounds: The volatile organic compound (VOC) concentrations (in grams per liter) of the paint or coating shall not exceed those listed below if the paint or coating is applied indoors, on-site. VOCs shall be tested in accordance with the U.S. Environmental Protection Agency (EPA) Test Method 24. The calculation of VOC shall exclude water, exempt solvents, and tinting color added at the point of sale.
 - a. Flat Interior Coatings: 50 g/L.
 - b. Non-Flat Interior Coatings: 150 g/L.
 - c. Gloss Anti-Corrosive Interior Coatings: 250 g/L.
 - d. Semi-Gloss Anti-Corrosive Interior Coatings: 250 g/L.
 - e. Flat Anti-Corrosive Interior Coatings: 250 g/L.
 - f. Floor Coatings: 250 g/L.
 - g. Flow Coatings: 420 g/L.
 - h. Pre-Treatment Wash Primers Coatings: 420 g/L.
 - i. Sanding Sealers (Non-Lacquer): 350 g/L.
 - j. Specialty Primers, Sealers, and Undercoats: 350 g/L.
- G. Transition Coat: Paint manufacturer's recommended coating for use where a residual existing coating is incompatible with the paint system.

2.3 MANUFACTURERS

- A. Provide paint products by one of the following manufacturers:
1. Benjamin Moore & Co.; www.benjaminmoore.com.
 2. Dow Corning Corp.; www.dowcorning.com.
 3. Evonik Corp. USA; www.protectosil.com.
 4. L&M Construction Chemicals; div. of Laticrete International, Inc.; www.laticrete.com.
 5. Miller Paint; www.millerpaint.com.
 6. PPG Industries, Inc.; www.ppg.com.
 7. Rodda Paint Co.; www.roddapaint.com.
 8. Sansin; www.sansin.com.
 9. Sherwin-Williams Co., The; www.sherwin-williams.com.
 10. Tnemec, Inc; www.tnemec.com.

2.4 EXTERIOR HIGH-PERFORMANCE COATING SYSTEMS

- A. Galvanized Ferrous Metal: Provide the following finish system over exterior ferrous-metal surfaces:
1. Semigloss Finish: One finish coat over an intermediate coat and a primer.
 - a. Primer: Epoxy primer applied at spreading rate recommended.
 - b. Intermediate Coat: Epoxy applied at spreading rate recommended to achieve a dry film thickness of 3 to 5 mils (0.076 to 0.127 mm).
 - c. Intermediate Coat: Aliphatic polyurethane enamel applied at spreading rate recommended to achieve a dry film thickness of 1.5 to 4 mils (0.038 to 0.102 mm).
 - d. Topcoat: Aliphatic polyurethane enamel applied at spreading rate recommended by manufacturer to achieve a dry film thickness of 1.5 to 4 mils (0.038 to 0.102 mm).
- B. Non-Galvanized, Unprimed Steel and Hollow Metal Work: Provide the following urethane, 3-Coat finish systems over exterior ferrous-metal surfaces, including structural steel at canopies and other locations:
1. Surface Preparation: SSPC-SP6.
 2. Primer: Aromatic polyurethane, mio-zinc filled primer:
 - a. Product: Series 394 PerimePrime by Tnemec; 330 g/L VOCs; shop-apply at 2.5 to 3.5 mils DFT.
 - b. Where a primer other than that specified has been applied, fully apply specified primer to all surfaces at the 3 mils DFT as a tie-coat for succeeding applications.
 3. Spot Primer: Same as primer; apply at 2.5 to 3.5 mils DFT.
 4. First field coat, 2-part polyamide epoxy coating:
 - a. Product: Series 27 F.C. Typoxy by Tnemec; 282 g/L VOCs; shop- or field-apply at 2 to 6 mils DFT.
 5. Second Field Coat: 2-part polyfunctional hybrid urethane coating; semi-gloss finish:
 - a. Product: Series 750 UVX by Tnemec; 99 g/L VOCs; shop- or field-apply at 2.5 to 5 mils DFT.

6. Alternate Second Field Coat: 2-part aliphatic acrylic polyurethane coating; semi-gloss finish:
 - a. Series 73 Endura-Shield by Tnemec; 325 g/L VOCs; shop- or field-apply at 2 to 5 mils DFT.
 7. Total dry-field thickness: No less than 8 mils DFT of field-applied coating.
 8. Touchup, aromatic polyurethane, mio-zinc filled primer:
 - a. Where shop-applied primer has been damaged or abraded, shop- or field-repairs shall consist of surface preparation by SSPC-SP6 followed by application of specified primer to bare surfaces.
 - C. Nonferrous Metal: Provide the following finish system over exterior nonferrous-metal surfaces:
 1. Semigloss Finish: One finish coat over an intermediate coat and a primer.
 - a. Primer: Epoxy primer applied at spreading rate recommended.
 - b. Intermediate Coat: Epoxy applied at spreading rate recommended to achieve a dry film thickness of 3 to 8 mils (0.076 to 0.203 mm).
 - c. Intermediate Coat: Aliphatic polyurethane enamel applied at spreading rate recommended to achieve a dry film thickness of 1.5 to 4 mils (0.038 to 0.102 mm).
 - d. Topcoat: Aliphatic polyurethane enamel applied at spreading rate recommended to achieve a dry film thickness of 1.5 to 4 mils (0.038 to 0.102 mm).
 - D. Wood, Semi-Transparent Finish: Provide the following finish system over exterior wood surfaces:
 1. Basis-of-Design Product: Log & Siding Formula by Timber Pro Coatings; www.timberprocoatingsusa.com.
 2. Color: TR 01 "Oregon Cedar".
- 2.5 INTERIOR HIGH-PERFORMANCE COATING SYSTEMS
- A. Ferrous Metal: Provide the following finish system over interior ferrous-metal surfaces:
 1. Semigloss Finish: One finish coat over an intermediate coat and a primer.
 - a. Primer: Epoxy primer applied at spreading rate recommended.
 - b. Intermediate Coat: Epoxy applied at spreading rate recommended to achieve a dry film thickness of 2 to 4 mils (0.051 to 0.102 mm).
 - c. Topcoat: Semigloss epoxy applied at spreading rate recommended to achieve a dry film thickness of 2 to 5 mils (0.051 to 0.127 mm).
 - d. Application: All interior ferrous metal substrates EXCEPT underside of metal floor and roof decks and piping, ductwork, conduit and other materials requiring painting suspended at the underside of floor and roof decks.
 2. Matte Finish: One finish coat over an intermediate coat and a primer.
 - a. Primer: Epoxy primer applied at spreading rate recommended.
 - b. Intermediate Coat: Epoxy applied at spreading rate recommended to achieve a dry film thickness of 2 to 4 mils (0.051 to 0.102 mm).
 - c. Topcoat: Matte epoxy applied at spreading rate recommended to achieve a dry film thickness of 2 to 5 mils (0.051 to 0.127 mm).
 - d. Application: Underside of metal floor and roof decks and piping, ductwork, conduit and other materials requiring painting suspended at the underside of floor and roof decks.

- B. Nonferrous Metal: Provide the following finish system over interior nonferrous-metal surfaces:
 - 1. Semigloss Finish: One finish coat over an intermediate coat and a primer.
 - a. Primer: Acrylic or epoxy primer, as recommended for this substrate, applied at spreading rate recommended.
 - b. Intermediate Coat: Epoxy applied at spreading rate recommended to achieve a dry film thickness of 2 to 5 mils (0.051 to 0.127 mm).
 - c. Topcoat: Semigloss epoxy applied at spreading rate recommended to achieve a dry film thickness of 2 to 5 mils (0.051 to 0.127 mm), unless otherwise indicated.
- C. Wood Substrates: Wood and exposed medium density fiberboard (MDF) casework.
 - 1. Epoxy System MPI INT 6.3L:
 - a. Prime Coat: Epoxy, matching topcoat.
 - b. Intermediate Coat: Epoxy, matching topcoat.
 - c. Topcoat: Epoxy, gloss, MPI #77.
- D. Gypsum Board and Plywood Substrates:
 - 1. Water-Borne Epoxy System: Single-component, non-catalyst; low VOC; water cleanup.
 - a. Primer: As applicable to intermediate coat and topcoat.
 - b. Intermediate Coat: Epoxy, matching topcoat.
 - c. Topcoat: Epoxy, eggshell.
 - 1) Basis-of-Design Product: Corotech Pre-Catalyzed Waterborne Wall Epoxy, Eggshell V342 by Benjamin Moore.
 - 2. Application: Gypsum board walls and plywood paneled walls at back of house areas.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. With Applicator present, examine substrates and conditions under which high-performance coatings will be applied, for compliance with coating application requirements.
 - 1. Apply coatings only after unsatisfactory conditions have been corrected and surfaces to receive coatings are thoroughly dry.
 - 2. Start of application is construed as Applicator's acceptance of surfaces within that particular area.
- B. Coordination of Work: Review other Sections in which primers or other coatings are provided to ensure compatibility of total systems for various substrates. On request, furnish information on characteristics of specified finish materials to ensure compatible primers.
 - 1. If a potential incompatibility of primers applied by others exists, obtain the following from the primer Applicator before proceeding:
 - a. Confirmation of primer's suitability for expected service conditions.
 - b. Confirmation of primer's ability to be top coated with materials specified.
 - 2. Notify the General Contractor about anticipated problems before using the coatings specified over substrates primed by others.

3.2 PREPARATION

- A. General: Remove plates, machined surfaces, and similar items already in place that are not to be coated. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and coating.
 - 1. After completing coating operations, reinstall items that were removed; use workers skilled in the trades involved.
- B. Cleaning: Before applying high-performance coatings, clean substrates of substances that could impair bond of coatings. Remove oil and grease before cleaning.
 - 1. Schedule cleaning and coating application so dust and other contaminants from cleaning process will not fall on wet, newly coated surfaces.
- C. Surface Preparation: Clean and prepare surfaces to be coated according to manufacturer's written instructions for each substrate condition and as specified.
 - 1. Provide barrier coats over incompatible primers or remove primers and reprime substrate.
 - 2. Cementitious Substrates: Prepare concrete, brick, and concrete masonry block, surfaces to be coated. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods to prepare surfaces.
 - a. Use abrasive blast-cleaning methods if recommended by coating manufacturer.
 - b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not coat surfaces if moisture content exceeds that permitted in manufacturer's written instructions.
- D. Material Preparation: Carefully mix and prepare coating materials according to manufacturer's written instructions.
 - 1. Maintain containers used in mixing and applying coatings in a clean condition, free of foreign materials and residue.
 - 2. Stir materials before applying to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into the material. Remove film and, if necessary, strain coating material before using.
 - 3. Use only the type of thinners approved by manufacturer and only within recommended limits.
- E. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of the same material are to be applied. Tint undercoats to match color of finish coat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

3.3 APPLICATION

- A. General: Apply high-performance coatings according to manufacturer's written instructions.
 - 1. Use applicators and techniques best suited for the material being applied.
 - 2. Do not apply high-performance coatings over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to forming a durable coating film.
 - 3. Coating colors, surface treatments, and finishes are indicated in the coating system descriptions.
 - 4. Provide finish coats compatible with primers used.
 - 5. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, convactor covers, grilles, covers for finned-tube radiation, and similar components are in

- place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.
- a. Coat surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before final installation, coat surfaces behind permanently fixed equipment or furniture with prime coat only.
 - b. Coat back sides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
- B. Scheduling Coating: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for coating as soon as practicable after preparation and before subsequent surface deterioration.
1. The number of coats and film thickness required is the same regardless of application method.
 - a. Omit primer on metal surfaces that have been shop primed and touchup painted.
 - b. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer.
 - c. Where manufacturer's written instructions require sanding, sand between applications to produce a smooth, even surface.
 - d. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until coating has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and application of another coat does not cause undercoat to lift or lose adhesion.
 2. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance. Give special attention to edges, corners, crevices, welds, exposed fasteners, and similar surfaces to ensure that they receive a dry film thickness equivalent to that of flat surfaces.
 3. Sequence: Roofing system substrate boards for fastened attachment shall be fully installed prior to painting of underside of metal roof decks, to ensure fasteners are painted-out with the deck and do not remain easily apparent.
- C. Application Procedures: Apply coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.
1. Brush Application: Use brushes best suited for material applied and of appropriate size for the surface or item being coated.
 - a. Apply primers and first coats by brush unless manufacturer's written instructions permit using roller or mechanical applicators.
 - b. Brush out and work brush coats into surfaces in an even film.
 - c. Eliminate cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Neatly draw glass lines and color breaks.
 2. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by manufacturer for the material and texture required.
 3. Spray Equipment: Use mechanical methods to apply coating if permitted by manufacturer's written instructions and governing regulations.
 - a. Use spray equipment with orifice size recommended by manufacturer for material and texture required.
 - b. Apply each coat to provide the equivalent hiding of brush-applied coats.

- c. Do not double back with spray equipment building-up film thickness of two coats in one pass, unless recommended by manufacturer.
- D. Minimum Coating Thickness: Apply each material no thinner than manufacturer's recommended spreading rate. Provide total dry film thickness of the entire system as recommended by manufacturer.
- E. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.
- F. Prime Coats: Before applying finish coats, apply a prime coat of material, as recommended by manufacturer, to material required to be coated or finished that has not been prime coated by others.
 - 1. Recoat primed and sealed substrates if there is evidence of suction spots or unsealed areas in first coat, to ensure a finish coat with no burn-through or other defects caused by insufficient sealing.
- G. Completed Work: Match approved Samples for color, texture, and coverage. Remove, refinish, or recoat work that does not comply with specified requirements.

3.4 CLEANING

- A. Cleanup: At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
 - 1. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

3.5 PROTECTION

- A. Protect work of other trades, whether being coated or not, against damage from coating operation. Correct damage by cleaning, repairing, replacing, and recoating, as approved by Architect, and leave in an undamaged condition.
 - 1. Provide "Wet Paint" signs to protect newly coated finishes. After completing coating operations, remove temporary protective wrappings provided by others to protect their work.
 - 2. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces. Comply with procedures specified in PDCA P1.

END OF SECTION

SECTION 10 14 00 - SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Code-required room identification signs.
 - 2. Code-required stair identification signs.
 - 3. Code-required egress signs, except lighted egress signage.
- B. Related Requirements:
 - 1. Division 26 "Electrical" for lighted egress signage.

1.2 SUBMITTALS

- A. General: Ensure that requests for substitution have been provided to the Architect and that the Architect has provided clear approval of the proposed substitution products prior to order placement, delivery and installation of products. Refer to Section 01 25 00 "Product Substitution Procedures".
- B. Product Data: For information only, include manufacturer's printed specifications, anchorage details and installation, and maintenance instructions for products to be used in the fabrication of signage and graphics work, and installation instructions for each type of sign and graphic unit.
- C. Shop Drawings: For manufacturing including plans, elevations, sections, details, fabrication and erection of signs and graphic work at not less than 1:20 scale. Show jointage, anchorage, accessory items, and finishes. Submit full-scale drawings of typical sign faces showing copy layout. Half-scale drawings shall be sufficient for sign faces 1 m by 1 m and larger.
- D. Samples for Initial Selection: For each type of sign indicated.
 - 1. Aluminum: Samples of each finish type and color, on 150 mm long sections of extrusions and not less than 100 mm squares of sheet or plate showing the full range of colors available
 - 2. Acrylic and Polycarbonate Sheet: Samples of each paint and silkscreen ink color painted onto the required thickness of material.
- E. For identification purposes, mark samples with the appropriate sign type application.
- F. Manufacturer Certificates: Signed by manufacturers certifying that they comply with requirements.

1.3 CLOSEOUT SUBMITTALS

- A. Maintenance Data.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications.

1.5 WARRANTY

- A. Special Warranty: Manufacturer warranty period of five (5) years.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Thermal Movements: For exterior signs, allow for thermal movements from ambient and surface temperature changes.
- B. Accessibility Standard: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1 for signs.

2.2 SIGNS

- A. Panel Sign: Sign with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles. Provide signs as indicated in Drawings.
- B. Room-Identification Sign: Sign with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles. Provide signs as indicated in Drawings.
- C. Interior Informational Signs: Sign with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles. Provide signs as indicated in Drawings.
- D. Emergency Evacuation Maps: Provide code required signage to meet occupancy.
- E. Interior Wayfinding Signage: Hanging directional sign as indicated in Drawings.

2.3 SIGNAGE MATERIALS

- A. Aluminum Sheet and Plate: ASTM B 209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
- B. Aluminum Extrusions: ASTM B 221, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
- C. Steel Materials:
 - 1. Metallic-Coated Steel Sheet: ASTM A 653, G90 coating, either commercial or forming steel.
 - 2. Steel Sheet: Uncoated, cold-rolled, ASTM A 1008, commercial steel, Type B, exposed electrolytic zinc-coated, ASTM A 879, Coating Designation 08Z, with steel-sheet substrate according to ASTM A 1008, commercial steel, exposed].
 - 3. Steel Members Fabricated from Plate or Bar Stock: ASTM A 529 or ASTM A 572, 42,000-psi minimum yield strength.
- D. Stainless-Steel Sheet: ASTM A 240 or ASTM A 666, Type 304, stretcher-leveled standard of flatness.
- E. Acrylic Sheet: ASTM D 4802, category as standard with manufacturer for each sign, Type UVF (UV filtering).
- F. Polycarbonate Sheet: ASTM C 1349, Appendix X1, Type II (coated, mar-resistant, UV-stabilized polycarbonate), with coating on both sides.
- G. Fiberglass Sheet: Multiple laminations of glass-fiber-reinforced polyester resin with UV-light stable, colorfast, nonfading, weather- and stain-resistant, colored polyester gel coat, and with manufacturer's standard finish.
- H. PVC Sheet: Manufacturer's standard, UV-light stable, PVC plastic.
- I. Plastic-Laminate Sheet: NEMA LD 3, general-purpose HGS grade, 0.048-inch nominal thickness.

- J. Vinyl Film: UV-resistant vinyl film of nominal thickness indicated, with pressure-sensitive, permanent adhesive on back; die cut to form characters or images as indicated and suitable for exterior applications.
- K. Paints and Coatings for Sheet Materials: Inks, dyes, and paints that are recommended by manufacturer for optimum adherence to surface and are UV and water resistant for colors and exposure indicated.

2.4 ACCESSORIES

- A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signage, noncorrosive and compatible with each material joined.
- B. Adhesive: As recommended by sign manufacturer.
- C. Two-Face Tape: Manufacturer's standard high-bond, foam-core tape, with adhesive on both sides.
- D. Magnetic Tape: Manufacturer's standard magnetic tape with adhesive on one side.
- E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.5 FABRICATION

- A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.
- B. Surface-Engraved Graphics: Machine engrave characters and other graphic devices into panel surface indicated to produce precisely formed copy, incised to uniform depth.
- C. Subsurface-Applied Graphics: Apply graphics to back face of clear face-sheet material to produce precisely formed image. Image shall be free of rough edges.
- D. Shop- and Subsurface-Applied Vinyl: Align vinyl film in final position and apply to surface. Firmly press film from the middle outward to obtain good bond without blisters or fishmouths.
- E. Signs with Changeable Message Capability: Fabricate signs to allow insertion of changeable messages as follows:
- F. Brackets: Fabricate brackets, fittings, and hardware for bracket-mounted signs to suit sign construction and mounting conditions indicated. Modify manufacturer's standard brackets as required.

2.6 GENERAL FINISH REQUIREMENTS

- A. Directional Finishes: Run grain with long dimension of each piece and perpendicular to long dimension of finished trim or border surface unless otherwise indicated.
- B. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.

2.7 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, Class I, 0.018 mm or thicker.
- B. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

2.8 METALLIC-COATED STEEL FINISHES

- A. Factory Prime Finish: After cleaning and pretreating, apply an air-dried primer compatible with the organic coating to be applied over it.

- B. Baked-Enamel or Powder-Coat Finish: After cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat to a minimum dry film thickness of 2 mils.

2.9 STEEL FINISHES

- A. Factory Prime Finish: After surface preparation and pretreatment, apply manufacturer's standard, fast-curing, lead- and chromate-free, universal primer.
- B. Baked-Enamel or Powder-Coat Finish: After cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat to a minimum dry film thickness of 2 mils.

2.10 STAINLESS-STEEL FINISHES

- A. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - 1. Directional Satin Finish: No. 4.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.
- B. Room-Identification Signs and Other Accessible Signage: Install in locations on walls as indicated and according to accessibility standard.

END OF SECTION

SECTION 10 26 00 - WALL PROTECTION

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. Corner guards (CG1 and CG2).
- B. Related Requirements:
 - 1. Section 01 81 13 "Sustainability Requirements".

1.3 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, impact strength, dimensions of individual components and profiles, and finishes for each impact-resistant wall protection unit.
- B. Sustainable Design Submittals: Refer to Section 01 81 13 "Sustainability Requirements".
- C. Samples for Initial Selection: For each type of impact-resistant wall protection unit indicated.
- D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.
 - 1. Impact-Resistant Wall Covering: 6 by 6 inches square.
- E. Warranty: Sample of special warranty.
- F. Maintenance Data: For each impact-resistant wall protection unit to include in maintenance manuals.
 - 1. Include recommended methods and frequency of maintenance for maintaining optimum condition of plastic covers under anticipated traffic and use conditions. Include precautions against using cleaning materials and methods that may be detrimental to plastic finishes and performance.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Corner-Guard Covers: Full-size plastic covers of maximum length equal to 2 percent of each type, color, and texture of cover installed, but no fewer than two, 48 inch long units.
 - 2. Mounting and Accessory Components: Amounts proportional to the quantities of extra materials. Package mounting and accessory components with each extra material.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
- B. Source Limitations: Obtain impact-resistant wall protection units from single source from single manufacturer.

- C. Product Options: Drawings indicate size, profiles, and dimensional requirements of impact-resistant wall protection units and are based on the specific system indicated. Refer to Section 01 40 00 "Quality 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. Surface-Burning Characteristics: Provide impact-resistant, plastic wall protection units with surface-burning characteristics as determined by testing identical products per ASTM E 84, NFPA 255, or UL 723 by UL or another qualified testing agency.
- E. Preinstallation Conference: Conduct conference at Project site.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store impact-resistant wall protection units in original undamaged packages and containers inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.
 - 1. Maintain room temperature within storage area at not less than 70 deg F during the period plastic materials are stored.
 - 2. Keep plastic sheet material out of direct sunlight.
 - 3. Store plastic wall protection components for a minimum of 72 hours, or until plastic material attains a minimum room temperature of 70 deg F.
 - a. Store covers in a horizontal position.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install impact-resistant wall protection units until building is enclosed and weatherproof, wet work is complete and dry, and HVAC system is operating and maintaining temperature at 70 deg F for not less than 72 hours before beginning installation and for the remainder of the construction period.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of impact-resistant wall protection units that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures.
 - b. Deterioration of plastic and other materials beyond normal use.
 - 2. Warranty Period: Five (5) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CORNER GUARDS, CG1 AND CG2

- A. Surface-Mounted, Plastic-Cover Corner Guards : Manufacturer's standard, PVC-free assembly consisting of snap-on, resilient plastic cover installed over retainer; including mounting hardware; fabricated with 90- or 135-degree turn to match wall condition.
 - 1. Basis-of-Design Product: Acrovyn Corner Guards by Construction Specialties; www.csgroup.com.
 - 2. Mounting: Surface-mounted at top of wall base; as indicated in Drawings.

3. Height: Full height, 96 inches minimum.
4. Return: 2 inches minimum.
5. Colors:
 - a. CG1: No. 933 "Mission White".
 - b. CG2: No. 262 "Driftwood".

2.2 MATERIALS

- A. Fasteners: Aluminum, nonmagnetic stainless-steel, or other noncorrosive metal screws, bolts, and other fasteners compatible with items being fastened. Use security-type fasteners where exposed to view.
- B. Adhesives and Sealants: Comply with low/ no VOC requirements in Section 01 81 13 "Sustainability Requirements".
- C. Adhesive: As recommended by impact-resistant plastic wall protection manufacturer and that complies with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.3 FABRICATION

- A. Preform curved semirigid, impact-resistant sheet wall covering in factory for radius and sheet thickness as follows:
 1. Sheet Thickness of 0.040 Inch: 24-inch radius.
 2. Sheet Thickness of 0.060 Inch: 36-inch radius.
- B. Assemble components in factory to greatest extent possible to minimize field assembly. Disassemble only as necessary for shipping and handling.
- C. Fabricate components with tight seams and joints with exposed edges rolled. Provide surfaces free of wrinkles, chips, dents, uneven coloration, and other imperfections. Fabricate members and fittings to produce flush, smooth, and rigid hairline joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and wall areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
- B. Examine walls to which impact-resistant wall protection will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.
 1. For impact-resistant wall protection units attached with adhesive or foam tape, 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.

3.2 PREPARATION

- A. Complete finishing operations, including painting, before installing impact-resistant wall protection system components.
- B. Before installation, clean substrate to remove dust, debris, and loose particles.

3.3 INSTALLATION

- A. General: Install impact-resistant wall protection units level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.
 - 1. Provide splices, mounting hardware, anchors, and other accessories required for a complete installation.
 - a. Provide anchoring devices to withstand imposed loads.
 - b. Where splices occur in horizontal runs of more than 20 feet, splice aluminum retainers and plastic covers at different locations along the run, but no closer than 12 inches.
 - c. Adjust end and top caps as required to ensure tight seams.
- B. Impact-Resistant Wall Covering: Install top and edge moldings, corners, and divider bars as required for a complete installation.

3.4 CLEANING

- A. Immediately after completion of installation, clean plastic covers and accessories using a standard, ammonia-based, household cleaning agent.
- B. Remove excess adhesive using methods and materials recommended in writing by manufacturer.

END OF SECTION

SECTION 10 28 00 - TOILET AND BATH ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Public-use restroom accessories.
 - 2. Residential unit restroom accessories.
- B. Related Requirements:
 - 1. Section 06 10 00 "Rough Carpentry" for coordination of blocking.
 - 2. Section 09 30 00 "Tiling" for coordination with restroom and bathroom accessories.

1.3 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Coordinate blocking locations for accessory anchor and attachment to partitions.
- C. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.4 SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
 - 2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
 - 3. Include electrical characteristics.
- B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
 - 1. Identify locations using room designations indicated.
 - 2. Identify accessories using designations indicated.
- C. Sample Warranty: For manufacturer's special warranty.

1.5 CLOSEOUT SUBMITTALS

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

1.6 WARRANTY

- A. Manufacturer's Special Warranty for Mirrors: Manufacturer agrees to repair or replace mirrors that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, visible silver spoilage defects.

2. Warranty Period: Fifteen (15) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- 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.

2.2 MANUFACTURERS

- A. Source Limitations: Obtain restroom and shower accessories from single source from single manufacturer for each type, except as otherwise indicated.
- B. Approved Manufacturers:
 1. American Specialties, Inc.; www.americanspecialties.com.
 2. Bobrick Washroom Equipment, Inc.; www.bobrick.com.
 3. IPS Corp.; www.ipscorp.com.
 4. Plumberex Specialty Products, Inc.; www.plumberex.com.
 5. Or approved equal.

2.3 PUBLIC-USE RESTROOM ACCESSORIES

- A. Toilet paper dispenser, TPD 1:
 1. Basis-of-Design Product: As selected by Architect.
- B. Recessed Napkin Dispenser/ Waste Bin:
 1. Basis-of-Design Product: As selected by Architect.
- C. Soap Dispenser:
 1. Basis-of-Design Product: As selected by Architect.
- D. Waste Dispenser Next to Toilet:
 1. Basis-of-Design Product: As selected by Architect.
- E. Grab Bars:
 1. Basis-of-Design Product: As selected by Architect.
- F. Coat Hooks:
 1. Basis-of-Design Product: As selected by Architect.
- G. Baby Changing Station:
 1. Basis-of-Design Product: As selected by Architect.

2.4 RESIDENTIAL-UNIT RESTROOM ACCESSORIES

- A. Semi-Recessed Toilet paper dispenser, TPD #:
 1. Basis-of-Design Product: Sunglow Standard Paper Holder with White Plastic Roller by Taymor Industries Ltd.; www.taymor.com.
 2. Product Number: 01-9408.
 3. Finish: Chrome.
 4. Screws: Concealed.

- B. Towel Bars:
 - 1. Basis-of-Design Product: Sunglow Towel Bar by Taymor Industries Ltd.; www.taymor.com.
 - 2. Product Number: 01-940024.
 - 3. Wall-mounted, cover snaps over mounting flange to conceal screws.
 - 4. Finish: Polished chrome.
 - 5. Length: 24 inches.
- C. Recessed Medicine Cabinet:
 - 1. Basis-of-Design Product: Jensen Builder Series by Jensen; www.ferguson.com.
 - 2. Dimensions: As selected by Architect.
 - 3. Shelf Finish: As selected by Architect.
 - 4. Frame: Polished Steel.
- D. Robe Hooks:
 - 1. Basis-of-Design Product: As selected by Architect.
- E. Shower Curtain Rod:
 - 1. Basis-of-Design Manufacturer: Taymor Industries Ltd.; www.taymor.com.
 - 2. Length: 5 feet.
 - 3. Finish: Stainless Steel.

2.5 UNDERLAVATORY GUARDS

- A. Underlavatory Guard: Insulating pipe covering for supply and drain piping assemblies that prevents direct contact with and burns from piping; allow service access without removing coverings.
 - 1. Material and Finish: Antimicrobial, molded plastic, color as selected by Architect (white or black).
 - 2. Acceptable Manufacturers:
 - a. Plumberex Specialty Products, Inc.; www.plumberex.com.
 - b. IPS Corp.; www.ipscorp.com.

2.6 FABRICATION

- A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.
- B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Grab Bars: Install to withstand a downward load of at least 250 lbf (1112 N), when tested according to ASTM F 446.

3.2 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.
- B. Remove temporary labels and protective coatings.
- C. Clean and polish exposed surfaces according to manufacturer's written instructions.

END OF SECTION

SECTION 10 41 16 - EMERGENCY KEY CABINETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Furnish and install exterior emergency key cabinets and accessories.
- B. Related Requirements:
 - 1. Section 06 10 00 "Rough Carpentry": for blocking as required.
 - 2. Division 07 "Thermal and Moisture Protection" Sections for coordination with exterior walls to receive recess-mounted exterior emergency key cabinets.

1.3 SUBMITTALS

- A. Prepare and submit under the provisions of Division 01 Section "Submittal Procedures".
 - 1. Product Data: Submit complete manufacturer's product data consisting of product description and specifications, test data and technical characteristic, safety precautions, preparations and installation instructions, maintenance instructions, and other pertinent technical information required for product use and functionalities.
 - 2. Shop Drawings: Submit complete shop drawings of all work of this Section, showing all pertinent details of construction and installation.
 - 3. Do not order materials or begin fabrication or installation until Architect's approval of submittals has been obtained.

1.4 WARRANTY

- A. In addition to the specific warranty requirements of the Contract, Contractor shall obtain in the Owner's name the standard written manufacturer's warranty of all products furnished and installed under this Section where such warranties are offered in the manufacturer's published product data. All these warranties shall be in addition to, and not in lieu of, other liabilities which the Contractor may have by law or other provisions of the Contract Documents.
 - 1. Warranty period: Five (5) years commence from the date of Substantial Completion.

PART 2 - PRODUCTS

2.1 EXTERIOR EMERGENCY KEY CABINETS

- A. Furnish and install recessed mounted exterior emergency key cabinets at exterior wall locations indicated adjacent to the front entrances or as directed by local Fire Department.
 - 1. Exterior emergency key cabinets shall be approximately 4 inches Hx5inches Wx3-3/4inches D capable of holding up to 10 keys and access cards in interior compartment, fabricated of heavy duty drill-resistant 1/4-inch solid steel housing; all welded construction.
 - 2. High security UL listed double-action rotating tumblers and hardened steel pins accessed by a biased cut key. Lock shall have 1/8 inch thick stainless steel dust cover with tamper

- seal mounting capability. Provide 4 keys to each cabinet master-keyed to the local Fire Department keying system.
- 3. Deadbar protected stainless steel hinge.
- 4. 1/2 inch thick steel door with three-bolt latch and weather resistant door gasket. Hinged door shall allow single hand operation.
- 5. Provide UL listed alarm tamper switch.
- 6. Provide recess mounting kits (RMK) with 7x7 inches face flange for recess mounting into the concrete or masonry walls.
- B. Basis-of-Design Product: Series 3200 Rapid Entry System Hinged Door by Knox Co.; www.knoxbox.com.
- C. Finish Color: As selected by Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Inspect all surfaces and verify that they are in proper condition to receive the work of this Section. Verify that field measurements are as indicated on reviewed and approved shop drawings.
- B. Coordinate device mounting locations with authorities having jurisdiction and obtain approval in writing prior to installation.
 - 1. Exterior emergency key cabinets mounting locations shall be as directed and approved by the local Fire Department.
- C. Beginning of installation means acceptance of substrate.

3.2 INSTALLATION

- A. All items under this Section which are specified to be installed as work of this Section shall be installed in strict accordance with the approved shop drawings and the manufacturer's printed instructions and recommendations required to be submitted as specified herein above.

END OF SECTION

SECTION 10 44 00 - FIRE PROTECTION SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Fire-protection cabinets.
 - 2. Fire extinguishers.

1.3 PREINSTALLATION CONFERENCE

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review methods and procedures related to fire-protection cabinets including, but not limited to, the following:
 - a. Schedules and coordination requirements.

1.4 SUBMITTALS

- A. Product Data: For each type of product. Show door hardware, cabinet type, trim style, and panel style. Include roughing-in dimensions and details showing recessed, semi-recessed, or surface-mounting method and relationships of box and trim to surrounding construction.
- B. Shop Drawings: For fire-protection cabinets. Include plans, elevations, sections, details, and attachments to other work.
- C. Samples: For each type of exposed finish required, prepared on Samples 6 by 6 inches square.
- D. Product Schedule: For fire-protection cabinets. Indicate whether recessed, semi-recessed, or surface mounted. Coordinate final fire-protection cabinet schedule with fire-extinguisher schedule to ensure proper fit and function. Use same designations indicated on Drawings.
- E. Maintenance Data: For fire-protection cabinets to include in maintenance manuals.

1.5 COORDINATION

- A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers required by code are accommodated.
- B. Coordinate sizes and locations of fire-protection cabinets with wall depths.

1.6 SEQUENCING

- A. Apply decals and lettering on field-painted fire-protection cabinets after painting is complete.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Fire-Protection Cabinets: Listed and labeled to comply with requirements in ASTM E 814 for fire-resistance rating of walls where they are installed.

- B. Electrical Components, Devices, and Accessories: For wired alarms at fire-protection cabinets, listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. NFPA Compliance, Extinguishers: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
- D. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
 - 1. Provide fire extinguishers approved, listed, and labeled by FM Global; where required.
- E. The Basis-of-Design Product's performance criteria, product properties and attributes, including materials and methods used in fabrication of and/or the manufacturing process of individual components or for entire system, as indicated in manufacturers' current published product literature at the date of the Contract Documents, shall establish the minimum performance requirement for the Project, regardless of inclusion in This Section.

2.2 FIRE-PROTECTION CABINET

- A. Basis-of-Design Product: Panorama Model 1017 by JL Industries, an Activar Construction Products Group, Inc.; www.activarcpg.com.
 - 1. Or approved equal.
 - 2. Finish: Stainless steel, no.4 finish.
 - 3. Lettering:
 - a. At Extinguisher: As selected by Architect and required by AHJ.
 - 4. Pull: Recessed, ADA compliant.
- B. Cabinet Construction: Nonrated, except where indicated otherwise.
 - 1. Fire-Rated Cabinets: Provide fire-rated cabinets where located in fire-rated walls, matching wall rating designation. Rated cabinets shall match basis-of-design product indicated. Provide factory-drilled mounting holes.
- C. Semi-recessed Cabinet: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face.
 - 1. Square-Edge Semi-recessed Trim: 2-1/2 inch square edge trim.
 - 2. Finish: Refer to Finishes article below.
- D. Door Style: Flush opaque panel, frameless, with no exposed hinges.
- E. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
 - 1. Provide recessed door pull and friction latch.
 - 2. Provide continuous hinge, of same material and finish as trim permitting door to open 180 degrees.
- F. Accessories:
 - 1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire-protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
 - 2. Door Lock: Cylinder lock, keyed alike to other cabinets, where required by AHJ.

3. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated or as directed by Architect.
 - a. Identify fire extinguisher in fire-protection cabinet with the words "FIRE EXTINGUISHER."
 - 1) Location: Applied to cabinet door.
 - 2) Application Process: Die-Cut.
 - 3) Lettering Color: Black.
 - 4) Orientation: Vertical.

G. Materials:

1. Cold-Rolled Steel: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.

2.3 FIRE EXTINGUISHERS

- A. Fire Extinguisher, for cabinets and wall mounted: Multipurpose dry-chemical type, industrial grade external cartridge operated multipurpose A-B-C portable dry chemical fire extinguishers in 10 lb. size. The extinguishers shall meet or exceed the U.L. ratings.
 1. Basis-of-Design Product, Fire Extinguisher: Cosmic 10E by JL Industries.
 2. Wall bracket mount or in cabinet, as indicated.

2.4 FABRICATION

- A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.
 1. Weld joints and grind smooth.
 2. Provide factory-drilled mounting holes.
 3. Prepare doors and frames to receive locks.
 4. Install door locks at factory.
- B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles.
 1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch thick.
 2. Miter and weld perimeter door frames.
- C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.5 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's AMP 500, "Metal Finishes Manual for Architectural and Metal Products," for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces of fire-protection cabinets from damage by applying a strippable, temporary protective covering before shipping.
- C. Finish fire-protection cabinets after assembly.
- D. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

- E. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
 - 1. Color and Gloss: Finished to match adjacent wall.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in for cabinets to verify actual locations of piping connections before cabinet installation.
- B. Examine walls and partitions for suitable framing depth and blocking where recessed and semi recessed cabinets will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare recesses for recessed and semi recessed fire-protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

- A. General: Install fire-protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction, but no higher than the following.
 - 1. Fire-Protection Cabinets Installation height: Install at height conforming to NFPA 10.
 - a. 54 inches above finished floor to top of cabinet.
- B. Fire-Protection Cabinets: Fasten cabinets to structure, square and plumb.
 - 1. Unless otherwise indicated, provide recessed fire-protection cabinets. If wall thickness is inadequate for recessed cabinets, provide semi recessed fire-protection cabinets.
 - 2. Provide inside latch and lock for break-glass panels.
 - 3. Fasten mounting brackets to inside surface of fire-protection cabinets, square and plumb.

3.4 ADJUSTING AND CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as fire-protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.
- B. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.
- C. On completion of fire-protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.
- D. Touch up marred finishes, or replace fire-protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire-protection cabinet and mounting bracket manufacturers.
- E. Replace fire-protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 10 55 00 - POSTAL SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Mail receptacles at interior locations.
 - 2. Cluster box units at exterior locations.
 - 3. Parcel lockers.

1.3 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 postal specialty.
- B. Shop Drawings: For postal specialties.
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Include identification sequence for compartments.
 - 3. Include layout of identification text.
 - 4. Include setting drawings, templates, and installation instructions for anchor bolts and other anchorages installed as part of the Work of other Sections.
- C. Samples for Verification: For each type of exposed finish, prepared on 6-by-6-inch-square Samples.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For postal specialties and finishes to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Key Blanks: 5 for every lock or fraction thereof, for each type of compartment-door lock installed.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Furnish lock keys with temporary identification for their respective locks, bagged, and securely taped inside the collection compartment for shipping.
- B. Deliver lock keys to Owner by registered mail or overnight package service with a record of each corresponding lock and key number.
- C. Deliver combination-lock combinations to Owner by registered mail or overnight package service with a record of each corresponding lock and combination.

1.7 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of postal specialties that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
 - a. Structural failures.
 - b. Faulty operation of hardware including electrical components.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MAIL RECEPTACLES

- A. Front-Loading, Horizontal Mail Receptacles: Consisting of multiple compartments with fixed, solid compartment backs, enclosed within recessed wall box. Provide access to compartments for distributing incoming mail from front of unit by unlocking master lock and swinging side-hinged master door to provide accessibility to entire group of compartments. Provide access to each compartment for removing mail by swinging compartment door.
1. Basis-of-Design Product: Versatile 4C series by Florence Corporation; www.florencemailboxes.com.
 - a. Or approved equal.
 - b. Mounting: Flush mounted.
 - c. Color: Custom color as selected by Architect.
 2. Front-Loading Master Door: Braced and framed to hold compartment doors; with master-door lock and concealed, full-length, stainless-steel piano hinge on one side. Fabricate master door to remain open while mail is deposited.
 - a. Master-Door Lock: Manufacturer's standard five-pin tumbler, cylinder lock; with three keys.
 3. Compartments with Aluminum Doors: Manufacturer's standard compartments with extruded aluminum doors. Equip each with lock, tenant identification, and concealed, full-length, flush hinge on one side. Provide one compartment prepared for master-door lock and with outgoing mail slot.
 - a. Compartments: As indicated on Drawings.
 - b. Tenant Identification: 2-inch-wide by 5/8-inch-high, clear-plastic cardholder set in recessed slot in face of compartment door. Provide cardboard strip and self-adhesive numbers.
 4. Compartment-Door Locks: Five-pin tumbler, cylinder spring-latch-type locks capable of at least 1000 key changes; with three keys for each compartment door. Key each compartment differently.
 5. Concealed Components and Mounting Frames: Aluminum or steel sheet with manufacturer's standard finish.
 6. Exposed Aluminum Finish: Finish surfaces exposed to view as follows:
 - a. Baked-Enamel or Powder-Coated Finish: Color as selected by Architect from manufacturer's full range.

2.2 CLUSTER BOX UNITS (CBUS)

- A. Cluster Box Units (CBUs): Consisting of multiple compartments enclosed within a freestanding, pedestal-mounted enclosure. Provide access to compartments for distributing incoming mail from front of unit by unlocking master lock and swinging pair of side-hinged master doors to provide accessibility to entire group of compartments. Provide access to each compartment for removing mail by swinging compartment door. Comply with USPS-B-1118G.
 - 1. Basis-of-Design Product: As selected by Architect.
 - a. Unit Size: As indicated on Drawings.
 - b. Color: Custom color as selected by Architect.
- B. Compartment Enclosure: Fabricated from aluminum sheet with aluminum mounting pedestal and weather-protection hood, with the number and size of compartments as selected by Architect.
- C. Compartment Doors and Frames: Fabricated from one-piece extruded aluminum or aluminum sheet. Equip each compartment door with lock, tenant identification, and concealed, full-length, flush hinge on one side. Provide outgoing mail slot with weather protection flap.
 - 1. Tenant Identification: Number engraved into face of compartment door.
 - 2. Compartment-Door Locks: Comply with USPS-L-1172C for locks and keys, or equivalent as approved by the USPS; with three keys for each compartment door. Key each compartment differently.
 - 3. Parcel-Locker-Compartment-Door Locks: Two-key security system in which control key provides access to parcel-locker-compartment key, which opens compartment and is retained once opened.
- D. Pedestal: Aluminum, with same finish as compartment enclosure and attached with theft-resistant fasteners.
- E. Exposed Aluminum Finish: Finish surfaces exposed to view with powder-coated finish in color as selected by Architect from manufacturer's full range of colors.

2.3 PARCEL LOCKERS

- A. Front-Loading Parcel Lockers: Consisting of single or multiple compartments enclosed within a larger enclosure of type indicated below. Provide access to compartments for distributing incoming parcels from front of unit. Provide access to each compartment for removing parcels by swinging compartment door.
 - 1. Basis-of-Design Product: Luxer Lockers by Luxer One; www.luxerone.com.
 - a. Style: As selected by Architect.
 - b. Color: As selected by Architect.

2.4 FABRICATION

- A. Form postal specialties to required shapes and sizes, with true lines and angles, square, rigid, and without warp, and with metal faces flat and free of dents or distortion. Make exposed metal edges and corners free of sharp edges and burrs and safe to touch. Fabricate doors of postal specialties to preclude binding, warping, or misalignment.
- B. Preassemble postal specialties in shop to greatest extent possible to minimize field assembly.
- C. Mill joints to a tight, hairline fit. Cope or miter corner joints. Form joints exposed to weather to exclude water penetration.
- D. Drill or punch holes required for fasteners and remove burrs. Use security fasteners where fasteners are exposed. If used, seal external rivets before finishing.

- E. Weld in concealed locations to greatest extent possible without distorting or discoloring exposed surfaces. Remove weld spatter and welding oxides from exposed surfaces.
- F. Fabricate tubular and channel frame assemblies with manufacturer's standard welded or mechanical joints. Provide subframes and reinforcement as required for a complete system to support loads.
- G. Where dissimilar metals will contact each other, protect against galvanic action by painting contact surfaces with bituminous coating or by applying other permanent separation as recommended by manufacturers of dissimilar metals.

2.5 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. 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 substrates, areas, and conditions, with Installer present, for compliance with requirements for roughing-in openings, clearances, and other conditions affecting performance of the Work.
- B. Examine walls and other adjacent construction for suitable conditions where units will be installed.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install postal specialties level and plumb, according to manufacturer's written instructions and roughing-in drawings.
 - 1. Where dissimilar metals are in permanent contact with each other, protect against galvanic action by painting contact surfaces with bituminous coating or by applying other permanent separation as recommended by manufacturer for this purpose.
 - 2. Where aluminum contacts grout, concrete, masonry, or wood, protect against corrosion by painting contact surfaces with bituminous coating.
- B. Horizontal Mail Receptacles: Install horizontal mail receptacles with center of tenant-door lock cylinders not more than 48 inches and bottom of receptacles not less than 15 inches above finished floor.
 - 1. Install removable-core and keyed-in door lock cylinders as required for each type of cylinder lock.
 - 2. Install and align two rack ladders for the first column of mail receptacles and one rack ladder for each additional adjacent column of mail receptacles.
- C. Mail Collection Boxes: Install collection boxes with handle of hopper doors not more than 48 inches above finished floor.

3.3 ADJUSTING, CLEANING, AND PROTECTION

- A. Remove temporary protective coverings and strippable films, if any, as postal specialties are installed unless otherwise indicated in manufacturer's written installation instructions.
- B. Adjust doors, hardware, and moving parts to function smoothly, and lubricate as recommended by manufacturer. Verify that integral locking devices operate properly.
- C. Touch up marred finishes or replace postal specialties that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by postal-specialty manufacturer.
- D. Replace postal specialties that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.
- E. On completion of postal-specialty installation, clean interior and exterior surfaces as recommended by manufacturer.

END OF SECTION

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SECTION 11 31 10 - RESIDENTIAL APPLIANCES

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 Residential Appliances:
 - 1. Refrigerators, including ADA compliant refrigerators.
 - 2. Hoods.
 - 3. Ranges, including ADA compliant ranges.
 - 4. Dishwashers, including ADA compliant dishwashers.
 - 5. Stacking clothes washer and dryer.
- B. Related Requirements:
 - 1. Section 05 50 00 "Metal Fabrications" for coordination of exhaust hood liner to receive blackened steel surround.
 - 2. Section 12 35 30 "Residential Casework" for coordination with casework.
 - 3. Division 22 "Plumbing" Sections for kitchen sinks, dishwasher air-gap fittings, and instant hot-water dispensers.
 - 4. Division 26 "Electrical" Sections for coordinating electrical connections.

1.3 PREINSTALLATION MEETINGS

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

1.4 SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include installation details, material descriptions, dimensions of individual components, and finishes for each appliance.
 - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.
 - 3. Include required clearances and installation requirements.
- B. Samples: For each exposed product and for each color and texture specified, in manufacturer's standard size.
- C. Product Schedule: For appliances. Use same designations indicated on Drawings.
- D. Qualification Data: For manufacturer.
- E. Product Certificates: For each type of appliance.
- F. Field quality-control reports.
- G. Sample Warranties: For manufacturers' special warranties.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For each residential appliance to include in operation and maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Maintains, within 20 miles (32 km) of Project site, a service center capable of providing training, parts, and emergency maintenance repairs.

1.7 WARRANTY

- A. Special Warranties: Manufacturer agrees to repair or replace residential appliances or components that fail in materials or workmanship within specified warranty period, except as qualified below:
 - 1. Warranty Period: Two years from date of Substantial Completion.
- B. Refrigerator/Freezer and Ice maker, Sealed System: Full warranty, including parts and labor, for on-site service on the product.
 - 1. Warranty Period for Sealed Refrigeration System: Five years from date of Substantial Completion.
 - 2. Warranty Period for Other Components: Two years from date of Substantial Completion.
- C. Dishwasher: Full warranty, including parts and labor, for on-site service on the product.
 - 1. Warranty Period for Deterioration of Tub and Metal Door Liner: Five years from date of Substantial Completion.
 - 2. Warranty Period for Other Components: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Electrical Appliances: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Accessibility: Where residential appliances are indicated to comply with accessibility requirements, comply with applicable provisions in the DOJ's 2010 ADA Standards for Accessible Design, the ABA standards of the Federal agency having jurisdiction, and ICC A117.1.
- C. Energy Star: Provide appliances that qualify for the EPA/ DOE Energy Star product-labeling program.

2.2 MANUFACTURERS

- A. Source Limitations: Obtain residential appliances from single source and each type of residential appliance from single manufacturer unless indicated otherwise.
- B. Basis-of-Design Manufacturers:
 - 1. Amana, div. of Whirlpool; www.amana.com.
 - 2. Bosch; www.bosch.us.
 - 1. Blomberg Appliances; www.blombergappliances.com.
 - 2. Frigidaire; www.frigidaire.com.
 - 3. Fulgor Milano; www.fulgor-milano.com.
 - 4. GE Appliances, div. of Haier Co.; www.geappliances.com.

5. Kenmore; www.kenmore.com.
6. Whirlpool; www.whirlpool.com.
7. Zephyr; www.zephyronline.com.
8. Or approved equal.

2.3 PRODUCTS

A. Refrigerators:

1. Basis-of-Design Product: Model no. FFHT1824UW, 18.0 Cu. Ft. Top Freezer Refrigerator by Frigidaire.

B. Refrigerators, ADA:

1. Provide: 30-inch wide, Nominal 16.5 to 18.0 Ct. Ft. Top Freezer, Non-Ice, Energy Star rated, ADA rated refrigerators; Manufacturer's standard "White" finish.
2. Approved Manufacturers: Amana; GE Appliances; Frigidaire; Kenmore; Whirlpool.

C. Hoods:

1. Basis-of-Design Product: Model no. JVX5305DJWW, 30-inch ENERGY STAR Certified Under the Cabinet Hood by GE Appliances.

D. Ranges:

1. Basis-of-Design Product: Model no. JBS360DMWW, 30-inch Free-Standing Electric Range by GE Appliances.

E. Ranges, ADA:

1. Basis-of-Design Product: Model no. JBS460DMWW, 30-inch Free-Standing Electric Range by GE Appliances.

F. Dishwashers:

1. Basis-of-Design Product: Model no. GDF630PGMWW, Front Control with Plastic Interior Dishwasher with Sanitize Cycle & Dry Boost by GE Appliances.

G. Dishwashers, ADA:

1. Basis-of-Design Product: Model no. GDT225SGLWW, ADA Compliant Stainless Steel Interior Dishwasher with Sanitize Cycle by GE Appliances.

H. Stacking Clothes Washer and Dryer:

1. Basis-of-Design Product: As selected by Architect.

2.4 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- 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, for compliance with requirements for installation tolerances, power connections, and other conditions affecting installation and performance of residential appliances.

- B. Examine roughing-in for piping systems to verify actual locations of piping connections before appliance installation.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install appliances according to manufacturer's written instructions.
- B. Built-in Equipment: Securely anchor units to supporting cabinets or countertops with concealed fasteners. Verify that clearances are adequate for proper functioning and that rough openings are completely concealed.
- C. Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.
- D. Range Anti-Tip Device: Install at each range according to manufacturer's written instructions.

3.3 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
 - 1. Perform visual, mechanical, and electrical inspection and testing for each appliance according to manufacturers' written recommendations. Certify compliance with each manufacturer's appliance-performance parameters.
 - 2. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.
 - 3. Operational Test: After installation, start units to confirm proper operation.
 - 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and components.
- B. An appliance will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

3.4 DEMONSTRATION

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

END OF SECTION

SECTION 12 21 13 - HORIZONTAL LOUVER BLINDS

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. Horizontal louver blinds with aluminum slats.

1.3 SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For horizontal louver blinds, include fabrication and installation details.
- C. Samples: For each exposed product and for each color and texture specified, 12 inches long.
- D. Samples for Initial Selection: For each type and color of horizontal louver blind.
 - 1. Include Samples of accessories involving color selection.
- E. Samples for Verification: For each type and color of horizontal louver blind indicated.
 - 1. Slat: Not less than 12 inches long.
 - 2. Tapes: Full width, not less than 6 inches long.
 - 3. Horizontal Louver Blind: Full-size unit, not less than 16 inches wide by 24 inches long.
 - 4. Valance: Full-size unit, not less than 12 inches wide.
- F. Product Schedule: For horizontal louver blinds. Use same designations indicated on Drawings.
- G. Product Test Reports: For horizontal louver blinds with polymer slats that have been tested for compliance with NFPA 701, for tests performed by a qualified testing agency.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For horizontal louver blinds to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
 - 1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 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. Deliver horizontal louver blinds in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not install horizontal louver blinds until construction and wet-work and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Where horizontal louver blinds are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain horizontal louver blinds from single source from single manufacturer.

2.2 HORIZONTAL LOUVER BLINDS, ALUMINUM SLATS

- A. Basis-of-Design Product: 102 Mini Blind with 8-gauge aluminum slats by Mariak; www.mariak.com.
- B. Flame-Resistance Rating: Comply with NFPA 701; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- C. Slats: Aluminum, UV stabilized, colored, opaque, and will not crack or yellow; antistatic, dust-repellent treated.
 - 1. Configuration: Manufacturer's standard 2-inch aluminum horizontal blinds.
 - 2. Color: As selected by Architect.
 - 3. Spacing: Manufacturer's standard.
 - 4. Profile: Manufacturer's standard.
 - 5. Features:
 - a. Lift-Cord Rout Holes: Minimum size required for lift cord and located near back (outside) edge of slat to maximize slat overlap and minimize light gaps between slats.
- D. Headrail: Formed steel or extruded aluminum; long edges returned or rolled. Headrail fully encloses operating mechanisms on three sides and ends.
 - 1. Manual Lift Mechanism:
 - a. Lift-Cord Lock: Variable; stops lift cord at user-selected position within full operating range.
 - b. Operator: Extension of lift cord(s) through lift-cord lock mechanism to form cord pull.
 - 2. Manual Tilt Mechanism: Enclosed worm-gear mechanism and linkage rod that adjusts ladders.
 - a. Tilt: Full.
 - b. Operator: Clear-plastic wand.
 - c. Over-Rotation Protection: Manufacturer's detachable operator or slip clutch to prevent over rotation of gear.
 - 3. Manual Lift-Operator and Tilt-Operator Locations: Manufacturer's standard unless otherwise indicated.

- E. Bottom Rail: Secures and protects ends of ladders and lift cords.
 - 1. Type: Manufacturer's standard.
- F. Lift Cord: Manufacturer's standard braided cord.
- G. Ladders: Evenly spaced across headrail at spacing that prevents long-term slat sag.
 - 1. Type: Braided cord.
- H. Valance: Manufacturer's standard.
- I. Mounting Brackets: With spacers and shims required for blind placement and alignment indicated.
 - 1. Type: As indicated.
 - 2. Intermediate Support: Provide intermediate support brackets to produce support spacing recommended by blind manufacturer for weight and size of blind.
- J. Hold-Down Brackets and Hooks or Pins: Manufacturer's standard.
- K. Colors, Textures, Patterns, and Gloss:
 - 1. Slats: As selected by Architect.
 - 2. Components: Provide rails, cords, ladders, and materials exposed to view matching or coordinating with slat color unless otherwise indicated.

2.3 HORIZONTAL LOUVER BLIND FABRICATION

- A. Product Safety Standard: Fabricate horizontal louver blinds to comply with WCMA A 100.1 including requirements for corded, flexible, looped devices; lead content of components; and warning labels.
- B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F:
 - 1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which blind is installed less 1/4 inch per side or 1/2 inch total, plus or minus 1/8 inch. Length equal to head-to-sill dimension of opening in which blind is installed less 1/4 inch, plus or minus 1/8 inch.
 - 2. Outside of Jamb Installation: Width and length as indicated, with terminations between blinds of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.
- C. Concealed Components: Noncorrodible or corrosion-resistant-coated materials.
 - 1. Lift-and-Tilt Mechanisms: With permanently lubricated moving parts.
- D. Mounting and Intermediate Brackets: Designed for removal and reinstallation of blind without damaging blind and adjacent surfaces, for supporting blind components, and for bracket positions and blind placement indicated.
- E. Installation Fasteners: No fewer than two fasteners per bracket, fabricated from metal noncorrosive to brackets and adjoining construction; type designed for securing to supporting substrate; and supporting blinds and accessories under conditions of normal use.
- F. Color-Coated Finish:
 - 1. Metal: For components exposed to view, apply manufacturer's standard baked finish complying with manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

- A. Install horizontal louver blinds level and plumb, aligned and centered on openings, and aligned with adjacent units according to manufacturer's written instructions.
 - 1. Locate so exterior slat edges are not closer than 1 inch from interior faces of glass and not closer than 1/2 inch from interior faces of glazing frames through full operating ranges of blinds.
 - 2. Install mounting and intermediate brackets to prevent deflection of headrails.
 - 3. Install with clearances that prevent interference with adjacent blinds, adjacent construction, and operating hardware of glazed openings, other window treatments, and similar building components and furnishings.

3.3 ADJUSTING

- A. Adjust horizontal louver blinds to operate free of binding or malfunction through full operating ranges.

3.4 CLEANING AND PROTECTION

- A. Clean horizontal louver blind surfaces after installation according to manufacturer's written instructions.
- B. Provide final protection and maintain conditions in a manner acceptable to manufacturer and Installer that ensures that horizontal louver blinds are without damage or deterioration at time of Substantial Completion.
- C. Replace damaged horizontal louver blinds that cannot be repaired in a manner approved by Architect before time of Substantial Completion.

3.5 DEMONSTRATION

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

END OF SECTION

SECTION 12 21 16 - VERTICAL LOUVER BLINDS

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. Vertical louver blinds with PVC vanes.
- B. Related Requirements:
 - 1. Section 06 10 00 "Rough Carpentry" for coordination and provision of wood blocking and grounds for mounting vertical louver blinds and accessories.

1.3 SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For vertical louver blinds, include fabrication and installation details.
- C. Samples: For each exposed product and for each color and texture specified, 12 inches long.
- D. Samples for Initial Selection: For each type of vertical louver blind.
 - 1. Include Samples of accessories involving color selection.
- E. Samples for Verification: For each type of vertical louver blind.
 - 1. Vane: Not less than 12 inches long.
 - a. Fabric: 3-1/2 inches wide from dye lot used for the Work. Mark top and face of material.
 - 2. Vertical Louver Blind: Full-size unit, not less than 36 inches wide by 36 inches long.
 - 3. Valance: Full-size unit, not less than 12 inches wide.
- F. Product Schedule: For vertical louver blinds. Use same designations indicated on Drawings.
- G. Product Test Reports: For vertical louver blinds with polymer vanes that have been tested for compliance with NFPA 701 for tests performed by a qualified testing agency.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For vertical louver blinds to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Vertical Louver Blinds: Full-size units equal to 5 percent of quantity installed for each size, color, texture, pattern, and finish indicated, but no fewer than two units.
 - 2. Vanes: Furnish quantity of full-size units equal to 5 percent of quantity installed for each type, size, texture, pattern, and finish indicated, but no fewer than two units.

1.6 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
 - 1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 2. 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 vertical louver blinds in factory packages, marked with manufacturer and product name, and location of installation using same designations indicated on Drawings.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not install vertical louver blinds until construction and wet-work and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Where vertical louver blinds are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain vertical louver blinds from single source from single manufacturer.
- B. Basis-of-Design Manufacturer: Mariak; www.mariak.com.
- C. Other Approved Manufacturers:
 - 1. Graber, div. of Springs Window Fashions; www.graberblinds.com.
 - 2. Hunter Douglas; www.hunterdouglas.com.
 - 3. Levolor; www.levolor.com.

2.2 VERTICAL LOUVER BLINDS, PVC VANES

- A. Basis-of-Design Product: 480 Vertical Blind by Mariak.
- B. Vanes: Lead-free, UV-stabilized, integrally colored, opaque, permanently flexible, extruded PVC that will not crack or yellow; with not less than 3/8-inch overlap when vanes are rotated fully closed.
 - 1. Width: 3-1/2 inches.
 - 2. Profile: Crowned.
 - 3. Flame-Resistance Rating: Comply with NFPA 701; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 4. Features:
 - a. Bottom chain.

- C. Headrail: Channel, formed steel or extruded aluminum with long edges returned or rolled and ends capped. Headrail encloses operating mechanisms including carrier-spacing mechanism that provides uniform vane spacing when blinds are traversed fully across headrail (closed).
 - 1. Manual Traverse Control: Wand.
 - 2. Manual Rotation Control: Wand.
 - 3. Manual Control Locations: As indicated on Drawings.
 - 4. Draw and Stack: As indicated on Drawings.
 - D. Carriers: Engineered plastic with gears to align and synchronize vane rotation and stems that allow vane removal and replacement. Lead carriers have self-lubricating wheels or elongated bearing surfaces; remaining carriers have self-lubricating wheels.
 - E. Valance: Manufacturer's standard with vane insert.
 - F. Mounting Brackets: With spacers and shims required for blind placement and alignment indicated.
 - 1. Type: As indicated.
 - 2. Intermediate Support: Provide intermediate support brackets to produce support spacing recommended by blind manufacturer for weight and size of blind.
 - G. Colors, Textures, and Patterns:
 - 1. Vanes: As selected by Architect from manufacturer's full range.
 - 2. Components: Provide materials exposed to view matching or coordinating with vanes unless otherwise indicated.
 - H. Applications: Residential Units, as indicated on Drawings.
- 2.3 VERTICAL LOUVER BLIND FABRICATION
- A. Product Safety Standard: Fabricate vertical louver blinds to comply with WCMA A 100.1 including requirements for corded, flexible, looped devices; lead content of components; and warning labels.
 - B. Unit Sizes: Fabricate units in sizes to cover window and other openings as follows, measured at 74 deg F:
 - 1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which blind is installed less 1/4-inch per side or 1/2-inch total, plus or minus 1/8-inch. Length equal to head-to-sill or -floor dimension of opening in which blind is installed less 1/4-inch, plus or minus 1/8-inch.
 - 2. Outside of Jamb Installation: Width and length as indicated, with terminations between blinds of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.
 - C. Concealed Components: Noncorrodible or corrosion-resistant-coated materials.
 - 1. Rotation-and-Traverse Mechanisms: With permanently lubricated moving parts.
 - D. Installation Brackets: Designed for easy removal and reinstallation of blind, for supporting headrail, valance, and operating hardware and for bracket positions and blind mounting method indicated.
 - E. Installation Fasteners: No fewer than two fasteners per bracket, fabricated from metal noncorrosive to brackets and adjoining construction; type designed for securing to supporting substrate; and supporting blinds and accessories under conditions of normal use.

- F. Color-Coated Finish: For metal components exposed to view unless anodized or plated finish is indicated. Apply manufacturer's standard baked finish complying with manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

- A. Install vertical louver blinds level and plumb, aligned and centered on openings, and aligned with adjacent units according to manufacturer's written instructions.
 - 1. Locate so exterior vane edges are not closer than 2 inches from interior faces of glass and not closer than 1-1/2 inches from interior faces of glazing frames through full operating ranges of blinds.
 - 2. Install mounting and intermediate brackets to prevent deflection of headrails.
 - 3. Install with clearances that prevent interference with adjacent blinds, adjacent construction, and operating hardware of glazed openings, other window treatments, and similar building components and furnishings.

3.3 ADJUSTING

- A. Adjust vertical louver blinds to operate free of binding or malfunction through full operating ranges.

3.4 CLEANING AND PROTECTION

- A. Clean vertical louver blind surfaces after installation according to manufacturer's written instructions.
- B. Provide final protection and maintain conditions in a manner acceptable to manufacturer and Installer that ensures that vertical louver blinds are without damage or deterioration at time of Substantial Completion.
- C. Replace damaged vertical louver blinds that cannot be repaired in a manner approved by Architect before time of Substantial Completion.

3.5 DEMONSTRATION

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

END OF SECTION

SECTION 12 24 13 - ROLLER WINDOW SHADES

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. Manually operated roller shades with single rollers.
 - 2. Installation accessories.
- B. Related Requirements:
 - 1. Section 06 10 00 "Rough Carpentry" for wood blocking and grounds for mounting roller shades and accessories.
 - 2. Section 07 92 00 "Joint Sealants" for sealing the perimeters of installation accessories for light-blocking shades with a sealant.

1.3 SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, features, finishes, and operating instructions for roller shades.
- B. Shop Drawings: Show fabrication and installation details for roller shades, including shadeband materials, their orientation to rollers, and their seam and batten locations.
- C. Samples: For each exposed product and for each color and texture specified, 10 inches long.
- D. Samples for Verification: For each type of roller shade.
 - 1. Shadeband Material: Not less than 10 inches square. Mark interior face of material if applicable.
 - 2. Roller Shade: Full-size operating unit, not less than 16 inches wide by 36 inches long for each type of roller shade indicated.
 - 3. Installation Accessories: Full-size unit, not less than 10 inches long.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For roller shades to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Roller Shades: Full-size units equal to 5 percent of quantity installed for each size, color, and shadeband material indicated, but no fewer than two units.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.

- B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
 - 1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 2. 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 roller shades in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not install roller shades until construction and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain roller shades from single source from single manufacturer.
- B. Basis-of-Design Manufacturer: MechoShade Systems, LLC; www.mechoshade.com.
- C. Other Approved Manufacturers:
 - 1. Draper, Inc.; www.draperinc.com.
 - 2. Hunter Douglas; www.hunterdouglasarchitectural.com.
 - 3. Lutron Electronics Co., Inc.; www.lutron.com.

2.2 MANUALLY OPERATED SHADES WITH SINGLE ROLLERS

- A. Basis-of-Design Product: Mecho/5 Manual Shade System by MechoShade.
- B. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.
 - 1. Bead Chains: Manufacturer's standard.
 - a. Loop Length: Full length of roller shade.
 - b. Limit Stops: Provide upper and lower ball stops.
 - c. Chain-Retainer Type: Clip or chain tensioner, jamb mount.
 - 2. Spring Lift-Assist Mechanisms: Manufacturer's standard for balancing roller shade weight and for lifting heavy roller shades.
 - a. Provide for shadebands that weigh more than 10 lb or for shades as recommended by manufacturer, whichever criterion is more stringent.

- C. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.
 - 1. Roller Drive-End Location: As indicated on Drawings.
 - 2. Direction of Shadeband Roll: Regular, from back (exterior face) of roller.
 - 3. Shadeband-to-Roller Attachment: Manufacturer's standard method.
- D. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.
 - 1. Basis-of-Design Product, Brackets: Catch-Pin Bracket by MechoShade.
- E. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join up to three inline rollers into a multiband shade that is operated by one roller drive-end assembly.
- F. Installation Accessories:
 - 1. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.
 - a. Basis-of-Design Product: SnapLoc Fascia by MechoShade.
 - 2. Exposed Headbox: Rectangular, extruded-aluminum enclosure including front fascia, top and back covers, endcaps, and removable bottom closure.
 - a. Height: Manufacturer's standard height required to enclose roller and shadeband assembly when shade is fully open, but not less than 3 inches.
 - 3. Endcap Covers: To cover exposed endcaps.
 - 4. Closure Panel and Wall Clip: Removable aluminum panel designed for installation at bottom of site-constructed ceiling recess or pocket and for snap-in attachment to wall clip without fasteners.
 - a. Closure-Panel Width: As indicated on Drawings.
- G. Applications: At Offices and Common spaces, or as indicated on Drawings.

2.3 SHADEBAND MATERIALS

- A. Shadeband Material Flame-Resistance Rating: Comply with NFPA 701 Insert requirement. Testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- B. Basis-of-Design Product: 1550 Series EcoVeil Screen by MechoShade.
 - 1. Light-Filtering Fabric: Woven fabric, stain and fade resistant.
 - a. Openness Factor: 3 percent.
 - b. Color: As selected by Architect.
- C. Roller-Coupling Assemblies: Where required.
- D. Installation Accessories:
 - 1. Side Channels: With light seals and designed to eliminate light gaps at sides of shades as shades are drawn down. Provide side channels with shadeband guides or other means of aligning shadebands with channels at tops.
 - 2. Bottom Sill Channel: With light seals and designed to eliminate light gaps at bottoms of shades when shades are closed.

2.4 ROLLER SHADE FABRICATION

- A. Product Safety Standard: Fabricate roller shades to comply with WCMA A 100.1, including requirements for flexible, chain-loop devices; lead content of components; and warning labels.
- B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F:
 - 1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which shade is installed less 1/4 inch per side or 1/2-inch total, plus or minus 1/8 inch . Length equal to head-to-sill or -floor dimension of opening in which shade is installed less 1/4 inch , plus or minus 1/8 inch .
 - 2. Outside of Jamb Installation: Width and length as indicated, with terminations between shades of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.
- C. Shadeband Fabrication: Fabricate shadebands without battens or seams to extent possible, except as follows:
 - 1. Vertical Shades: Where width-to-length ratio of shadeband is equal to or greater than 1:4 Insert ratio, provide battens and seams at uniform spacings along shadeband length to ensure shadeband tracking and alignment through its full range of movement without distortion of the material.
 - 2. Skylight Shades: Provide battens and seams at uniform spacings along shadeband as required to ensure shadeband tracking and alignment through its full range of movement without distortion or sag of material.
 - 3. Railroaded Materials: Railroad material where material roll width is less than the required width of shadeband and where indicated. Provide battens and seams as required by railroaded material to produce shadebands with full roll-width panel(s) plus, if required, one partial roll-width panel located at top of shadeband.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, locations of connections to building electrical system, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ROLLER SHADE INSTALLATION

- A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions.
 - 1. Opaque Shadebands: Located so shadeband is not closer than 2 inches to interior face of glass. Allow clearances for window operation hardware.

3.3 ADJUSTING

- A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.4 CLEANING AND PROTECTION

- A. Clean roller shade surfaces, after installation, according to manufacturer's written instructions.

- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.
- C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

END OF SECTION

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SECTION 12 35 30 - RESIDENTIAL CASEWORK

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes: Casework (PL-#).
 - 1. Kitchen cabinets.
 - 2. Vanity cabinets.
 - 3. Hardware.
 - 4. Cabinet finishes.
- B. Related Requirements:
 - 1. Section 06 10 00 "Rough Carpentry" for wood blocking for anchoring casework.
 - 2. Section 09 22 16 "Non-Structural Metal Framing" for reinforcements in metal-framed partitions for anchoring casework.

1.2 DEFINITIONS

- A. MDF: Medium-density fiberboard.
- B. Exposed Surfaces of Cabinets: Surfaces visible when doors and drawers are closed, including visible surfaces in open cabinets or behind glass doors.
- C. Semiexposed Surfaces of Cabinets: Surfaces behind opaque doors or drawer fronts, including interior faces of doors, interiors and sides of drawers, and bottoms of wall cabinets.
- D. Concealed Surfaces of Cabinets: Surfaces not usually visible after installation, including sleepers, web frames, dust panels, bottoms of drawers, ends of cabinets installed directly against and completely concealed by walls or other cabinets, and tops of wall cabinets and utility cabinets.

1.3 COORDINATION

- A. Coordinate layout and installation of blocking and reinforcement in partitions for support of casework.
- B. Coordinate layout with appliances and soffit and other existing construction at time of installation.

1.4 SUBMITTALS

- A. Product Data: For each type of product, including panel products, adhesives, fire-retardant-treated materials, and finishing materials and processes.
 - 1. Cabinets.
 - 2. Cabinet hardware.
 - 3. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.
- B. Shop Drawings: Include plans, elevations, details, and attachments to other work. Show materials, finishes, filler panels, and hardware.
- C. Samples: For cabinet finishes.
- D. Samples for Initial Selection: For cabinet finishes.
- E. Samples for Verification: 8-by-10-inch Samples for each type of finish and the following:
 - 1. Exposed hardware, for each type of item.

- F. Qualification Data: For manufacturer, fabricator and/ or installer.
- G. Product Certificates: For each type of product.
- H. Woodwork Quality Standard Compliance Certificates: AWI Quality Certification Program certificates or WI Certified Compliance Program certificates.
- I. 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.
- B. Installer Qualifications: Fabricator of products.
- 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.

1.6 DELIVERY, STORAGE, AND HANDLING

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

1.7 FIELD CONDITIONS

- A. Established Dimensions: Where casework is indicated to fit to other construction, establish dimensions for areas where casework is to fit. Coordinate construction to ensure that actual dimensions correspond to established dimensions. Provide fillers and scribes to allow for trimming and fitting.
- B. Field Measurements: Where casework is indicated to fit to existing construction, verify dimensions of existing construction by field measurements before fabrication and indicate measurements on Shop Drawings. Provide fillers and scribes to allow for trimming and fitting.
 - 1. Walls at both ends of cabinets in any continuous or broken run shall be considered existing construction.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. All Composite Wood products shall be made using ultra-low-emitting formaldehyde (ULEF) resins as defined in the California Air Resources Board's "Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products" (CARB Phase II) or shall be made with no added formaldehyde (NAF).

2.2 CASEWORK, PL-#

- A. Modular all wood construction cabinets (no particleboard), stile and rail hardwood doors with inset panel; hardwood drawer fronts; clear finish, no added formaldehyde, CARB 2 compliant.
- B. Basis-of-Design Products:
 - 1. Kitchens and Vanities at Residential Units: Stewart Collection, Shaker style by Lanz Cabinets; lanzcabinets.com.
 - a. Species: Natural Beech.

2. Kitchens at Accessible Residential Units: Stewart Collection, Durham style by Lanz Cabinets; lanzcabinets.com.
 - a. Species: Natural Beech.
 - C. Quality Standard: Provide cabinets that comply with KCMA A161.1.
 - D. Exposed Cabinet End Finish: Thermofoil.
 1. For end or side panels that are exposed on two sides, internal side shall be color matched or finish matched with external side.
 - E. Back, Top, and Bottom Rails: 3/4-by-2-1/2-inch solid wood, interlocking with end panels and rabbeted to receive top and bottom panels. Back rails secured under pressure with glue and with mechanical fasteners.
 - F. Wall-Hung-Unit Back Panels: 3/16-inch-thick plywood fastened to rear edge of end panels and to top and bottom rails.
 - G. Base-Unit Back Panels: 1/8-inch-thick hardboard fastened to rear edge of end panels and to top and bottom rails.
 - H. Front Frame Drawer Rails: 3/4-by-1-1/4-inch solid wood mortised and fastened into face frame.
 - I. Drawers: Metal box drawer construction with 5/8-inch-thick drawer bottoms and backs. Provide full extension, self-closing ("soft close").
 1. Deduct Alternate: Provide cost deduction for manufacturer's standard drawer system for three quarter extension, non-self-closing ("soft close").
 - J. Shelves: 3/4-inch-thick particleboard or 5/8-inch-thick plywood.
 - K. Pull-out Trash Assembly: Provide as indicated in Drawings and as follows:
 1. Include double 35 quart containers.
 2. Utilize full-extension glides.
 3. Provide with swing cabinet door enclosure.
 4. Allow for minimum 100 lbs. weight capacity.
 - L. Valences: 3/4-inch-thick particleboard or 5/8-inch-thick plywood; upper cabinets shall be provided with valence as indicated; valence finish shall match upper cabinet finish.
 - M. Joinery: Rabbet backs flush into end panels and secure with concealed mechanical fasteners. Connect tops and bottoms of wall cabinets and bottoms and stretchers of base cabinets to ends and dividers with mechanical fasteners. Rabbet tops, bottoms, and backs into end panels.
 - N. Factory Finishing: Finish cabinets at factory. Defer only final touchup until after installation.
- 2.3 CABINET MATERIALS
- A. General: All composite wood materials and products shall be California Phase 2 Compliant (CARB 2 Compliant) as regulated by the California Air Resources Board's (CARB).
 - B. Hardwood Lumber: Kiln dried to 7 percent moisture content.
 - C. Softwood Lumber: Kiln dried to 10 percent moisture content.
 - D. Hardwood Plywood: HPVA HP-1.
 - E. Particleboard: ANSI A208.1, Grade M-2.
 - F. Particleboard: Straw-based particleboard complying with requirements in ANSI A208.1, Grade M-2, except for density.
 - G. MDF: ANSI A208.2, Grade MD.

- H. Hardboard: ANSI A135.4, Class 1 Tempered.
- I. Exposed Materials: Thermofoil.
- J. Semiexposed Materials: Unless otherwise indicated, provide the following:
 - 1. Match exposed faces.
- K. Concealed Materials: Solid wood or plywood, of any hardwood or softwood species, with no defects affecting strength or utility; particleboard; MDF; or hardboard.
 - 1. Core: Terra NAF Particleboard or plywood.

2.4 CABINET HARDWARE

- A. General: Manufacturer's standard units complying with BHMA A156.9, of type, size, style, material, and finish as indicated.
- B. Pulls: Back-mounted decorative pulls.
- C. Hinges: Concealed European-style, self-closing ("soft close") hinges.
- D. Drawer Guides: Epoxy-coated-metal, self-closing drawer guides; designed to prevent rebound when drawers are closed; with nylon-tired, ball-bearing rollers; and complying with BHMA A156.9, Type B05011 or Type B05091.
- E. Angle Clips: Provide metal angle clips for installation of end or side panels that are not integrated to the cabinet box, e.g. stand-alone panel at end run where a dishwasher is indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances, location of framing and reinforcements, and other conditions affecting performance of casework.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 CABINET 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.
- 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.
 - 1. Provide toe kick panels scribed to floors; toe kick finish shall match base cabinet finish.
- D. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts. Utilize fillers and scribes to allow for trimming and fitting.
 - 1. Provide filler panels against walls to ensure cabinet doors can open fully 90 degrees.
- 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 or finishing screws for exposed fastening, countersunk and filled flush with woodwork.
 - 1. For shop finished items use filler matching finish of items being installed.
- F. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.

1. Install cabinets with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
 2. Maintain veneer sequence matching of cabinets with transparent finish.
 3. 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.
- G. Touch up finishing work specified in this Section after installation of woodwork. Fill nail holes with matching filler where exposed.
1. Apply specified finish coats, including stains and paste fillers if any, to exposed surfaces where only sealer/prime coats are applied in shop.

3.3 COUNTERTOP INSTALLATION

- A. Install countertops level to a tolerance of 1/8 inch in 8 feet, 1/4 inch maximum. Do not exceed 1/64-inch difference between planes of adjacent units.
- B. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Predrill holes for screws as recommended by manufacturer. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
- C. Fasten subtops to cabinets by screwing through subtops into cornerblocks of base cabinets. Shim as needed to align subtops in a level plane.
- D. Secure countertops to subtops with adhesive according to solid surface material manufacturer's written instructions. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
- E. Bond joints with adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to joints to prevent adhesive smears.
1. Install metal splines in kerfs in countertop edges at joints. Fill kerfs with adhesive before inserting splines and remove excess immediately after adjoining units are drawn into position.
 2. Clamp units to temporary bracing, supports, or each other to ensure that countertops are properly aligned and joints are of specified width.
- F. Install backsplashes and end splashes by adhering to wall and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears.
- G. Install aprons to backing and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears. Fasten by screwing through backing. Predrill holes for screws as recommended by manufacturer.
- H. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.
1. Seal edges of cutouts in particleboard subtops by saturating with varnish.
- I. Apply sealant to gaps at walls; comply with Section 07 92 00 "Joint Sealants."

3.4 ADJUSTING AND CLEANING

- A. Adjust cabinets and hardware so doors and drawers are centered in openings and operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.

- B. Clean casework on exposed and semiexposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas.

END OF SECTION

SECTION 12 36 61.19 - QUARTZ AGGLOMERATE COUNTERTOPS

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. Quartz agglomerate countertops.
 - 2. Quartz agglomerate backsplash.
- B. Related Requirements:
 - 1. Section 12 35 30 "Residential Casework".
 - 2. Division 22 "Plumbing" sections for coordination of sinks and plumbing fixtures.
 - 3. Room Finish Schedule on the Drawings for specific products, colors and finishes.

1.3 SUBMITTALS

- A. Product Data: For countertop materials.
- B. Shop Drawings: For countertops. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.
 - 1. Show locations and details of joints.
 - 2. Show direction of directional pattern, if any.
- C. Samples for Initial Selection: For each type of material exposed to view.
- D. Samples for Verification: For the following products:
 - 1. Countertop material, 6 inches square.
 - 2. Wood trim, 8 inches long.
 - 3. One full-size solid surface countertop, with front edge, 8 by 10 inches, of construction and in configuration specified.
- E. Qualification Data: For fabricator.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For countertops include maintenance manuals. Include product data for care products used or recommended by Installer and names, addresses, and telephone numbers of local sources for products.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate countertops similar to that required for this Project, and whose products have a record of successful in-service performance.
- B. Installer Qualifications: Fabricator of countertops.
- C. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for fabrication and execution.

1. Build mockup of typical countertop 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 FIELD CONDITIONS

- A. Field Measurements: Verify dimensions of countertops by field measurements after base cabinets are installed but before countertop fabrication is complete.

1.7 COORDINATION

- A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

PART 2 - PRODUCTS

2.1 QUARTZ AGGLOMERATE COUNTERTOP MATERIALS

- A. Quartz Agglomerate: Solid sheets consisting of quartz aggregates bound together with a matrix of polymers, resins, and pigment and complying with ISFA 3-01.
 1. Acceptable Manufacturers:
 - a. Caesarstone; www.caeserstoneus.com.
 - b. Basix Surfaces; www.basixsurfaces.com.
 - c. M S International, Inc. (MSI); www.msisurfaces.com.
 - d. Porcelanosa; www.porcelanosa-usa.com.
 - e. Or approved equal.
 2. Countertop Thickness, Color, and Finish: As indicated.
- B. Countertop Substrate Plywood: Exterior softwood plywood complying with DOC PS1, Grade C-C Plugged, touch sanded.

2.2 COUNTERTOP FABRICATION

- A. Fabricate countertops according to manufacturer's written instructions and the AWI/AWMAC/WI's "Architectural Woodwork Standards."
 1. Grade: Premium.
 2. Edge Configuration (Front and exposed ends): Straight, slightly eased edge at top.
- B. Fabricate tops with shop-applied edges unless otherwise indicated. Comply with manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.
 1. Fabricate with loose backsplashes for field assembly.
- C. Cutouts and Holes:
 1. Undercounter Plumbing Fixtures: Make cutouts for fixtures using template or pattern furnished by fixture manufacturer. Form cutouts to smooth, even curves.
 - a. Provide vertical edges, slightly eased at juncture of cutout edges with top and bottom surfaces of countertop and projecting 3/16 inch into fixture opening.
 - b. Provide vertical edges, rounded to 3/8-inch radius at juncture of cutout edges with top surface of countertop, slightly eased at bottom, and projecting 3/16 inch into fixture opening.
 - c. Provide 3/4-inch full bullnose edges projecting 3/8 inch into fixture opening.

2. Counter-Mounted Plumbing Fixtures: Prepare countertops in shop for field cutting openings for counter-mounted fixtures. Mark tops for cutouts and drill holes at corners of cutout locations. Make corner holes of largest radius practical.
3. Fittings: Drill countertops in shop for plumbing fittings, undercounter soap dispensers, and similar items.

2.3 INSTALLATION MATERIALS

- A. Adhesive: Product recommended by countertop manufacturer.
 1. Adhesives shall have a VOC content of 70 g/L or less.
 2. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- B. Sealant for Countertops: Comply with applicable requirements in Section 07 92 00 "Joint Sealants."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates to receive solid surface countertops and conditions under which countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of countertops.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install countertops level to a tolerance of 1/8 inch in 8 feet, 1/4 inch maximum. Do not exceed 1/64-inch difference between planes of adjacent units.
- B. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Predrill holes for screws as recommended by manufacturer. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with solid surface manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
- C. Fasten subtops to cabinets by screwing through subtops into cornerblocks of base cabinets. Shim as needed to align subtops in a level plane.
- D. Secure countertops to subtops with adhesive according to solid surface manufacturer's written instructions. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with solid surface manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
- E. Bond joints with adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to joints to prevent adhesive smears.
 1. Install metal splines in kerfs in countertop edges at joints. Fill kerfs with adhesive before inserting splines and remove excess immediately after adjoining units are drawn into position.
 2. Clamp units to temporary bracing, supports, or each other to ensure that countertops are properly aligned and joints are of specified width.
- F. Install backsplashes and end splashes by adhering to wall and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears.

- G. Install aprons to backing and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears. Fasten by screwing through backing. Predrill holes for screws as recommended by manufacturer.
- H. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.
 - 1. Seal edges of cutouts in plywood subtops by saturating with varnish.
- I. Apply sealant to gaps at walls; comply with Section 07 92 00 "Joint Sealants."

END OF SECTION

SECTION 12 48 13 - ENTRANCE FLOOR MATS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Entrance walk-off mats (WOM).

1.3 COORDINATION

- A. Coordinate size and location of recesses in concrete to receive floor mats and frames.

1.4 SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for floor mats and frames.
- B. Shop Drawings:
 - 1. Items penetrating floor mats and frames, including door control devices.
 - 2. Divisions between mat sections.
 - 3. Perimeter floor moldings frames.
 - 4. Custom Graphics: Scale drawing indicating colors.
- C. Samples: For the following products, in manufacturer's standard sizes:
 - 1. Floor Mat: Assembled sections of floor mat.
 - 2. Tread Rail: Sample of each type and color.
 - 3. Frame Members: Sample of each type and color.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For floor mats and frames to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Resilient-Tile Entrance Mats: Full-size tile units equal to 2 percent of amount installed, but no fewer than 10 units.

PART 2 - PRODUCTS

2.1 ENTRANCE WALK-OFF MATS, WOM

- A. Carpet-Type Mats: Nylon wool blend, carpet bonded to 1/8- to 1/4-inch-thick, flexible vinyl backing to form mats 3/8 or 7/16 inch thick with nonraveling edges.
 - 1. Basis-of-Design Product: As selected by Architect.
 - 2. Other Acceptable Manufacturers:
 - a. Construction Specialties, Inc.; www.c-sgroup.com.
 - b. Interface; www.interface.com.
 - 3. Color: As selected by Architect.
 - 4. Size: As indicated.

2.2 FABRICATION

- A. Floor Mats: Shop fabricate units to greatest extent possible in sizes indicated. Unless otherwise indicated, provide single unit for each mat installation; do not exceed manufacturer's recommended maximum sizes for units that are removed for maintenance and cleaning. Where joints in mats are necessary, space symmetrically and away from normal traffic lanes. Miter corner joints in framing elements with hairline joints or provide prefabricated corner units without joints.
- B. Recessed Frames: As indicated, for permanent recessed installation, complete with corner pins or reinforcement and anchorage devices.
 - 1. Fabricate edge-frame members in single lengths or, where frame dimensions exceed maximum available lengths, provide minimum number of pieces possible, with hairline joints equally spaced and pieces spliced together by straight connecting pins.
- C. Coat concealed surfaces of aluminum frames that contact cementitious material with manufacturer's standard protective coating.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and floor conditions for compliance with requirements for location, sizes, minimum recess depth, and other conditions affecting installation of floor mats and frames.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install recessed mat frames and mats to comply with manufacturer's written instructions so that tops of mats will be flush with adjoining finished flooring. Set mats with tops at height recommended by manufacturer for most effective cleaning action; coordinate tops of mat surfaces with bottoms of doors that swing across mats to provide clearance between door and mat.
 - 1. For installation in terrazzo flooring areas, allow for grinding and polishing of terrazzo without grinding surface of recessed frames. Coordinate with other trades as required.
 - 2. Install necessary shims, spacers, and anchorages for proper location, and secure attachment of frames.
 - 3. Install grout and fill around frames and, if required to set mat tops at proper elevations, in recesses under mats. Finish grout and fill smooth and level.
 - 4. Delay setting mats until construction traffic has ended.

- B. Install surface-type units to comply with manufacturer's written instructions; coordinate with entrance locations and traffic patterns.
 - 1. Anchor fixed surface-type frame members to floor with devices spaced as recommended by manufacturer.

3.3 PROTECTION

- A. After completing frame installation and concrete work, provide temporary filler of plywood or fiberboard in recesses and cover frames with plywood protective flooring. Maintain protection until construction traffic has ended and Project is near Substantial Completion.

END OF SECTION

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SECTION 12 93 13 - BICYCLE RACKS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Interior bicycle racks.
- B. Related Requirements:
 - 1. Section 03 30 00 "Cast-in-Place Concrete".
 - 2. Section 09 29 00 "Gypsum Board Assemblies".

1.3 SUBMITTALS

- A. Product Data: For each bicycle rack indicated.
 - 1. Include manufacturer's installation instructions.
 - 2. Fastener for wall-mounted bicycle racks.
- B. Shop Drawings:
 - 1. Indicate field-verified clearances, rack spacing, mounting heights.
 - 2. Include all component and fittings.
 - 3. Indicate fastener type and embedment depth where applicable.
- C. Samples for Verification: For each finish product specified, two samples, minimum size 6 inches square representing actual product, color, and patterns.
- D. Sample warranty.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed installation of bicycle racks similar in material, design, and extent to that indicated for this project and whose work has resulted in construction with a record of successful in-service performance.

1.5 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer and Installer agree(s) to repair or replace components of or units in entirety, that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Three years from date of Substantial Completion

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Manufacturer: Ground Control Systems; www.groundcontrolsystems.com.
- B. Other Approved Manufacturers:
 - 1. Dero; www.dero.com.

2. Huntco Site Furnishings; www.huntco.com.
3. Or approved equal.

2.2 MANUFACTURED UNITS

- A. Interior Bicycle Rack:
 1. Basis-of-Design Product: As selected by Architect.
 2. Mounting and Configuration: Wall mounted; configuration as indicated on Drawings.
 3. Finish: Manufacturer's standard.
 - a. Color: As selected by Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances, and other conditions affecting performance.
 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections.
 2. Verify that blocking has been properly installed at locations to receive wall-mounted bicycle racks.
 3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written recommendations.

3.3 INSTALLATION

- A. Install in accordance with manufacture's written instructions.

3.4 PROTECTION

- A. Protect installed products until completion of project.

END OF SECTION

SECTION 220000
PLUMBING

PART 1 - GENERAL

1.1 GENERAL CONDITIONS

- A. Requirements of the General and Special Conditions of these Specifications apply to all work. The Contractor shall consult them in detail and assume all obligations or conditions therein which affect this work.

1.2 SCOPE OF WORK

- A. This Contractor shall furnish all plant, labor, equipment, and shall perform all operations in connection with the Plumbing Systems as outlined below, in strict accordance with these conditions of the Contract. Any incidental work not shown or specified which can reasonably be inferred or taken as belonging to the work and necessary to provide the system described and shown shall be the Contractor's responsibility. The work shall be complete and ready for service as shown and/or specified and shall be satisfactory to the Architect.

1.3 WORK INCLUDED

- A. The work includes, in general, the following:
 - 1. Sanitary sewer piping and vent piping.
 - 2. Hot and cold water piping.
 - 3. Condensate piping.
 - 4. Rainwater Leader and Overflow piping.
 - 5. Plumbing fixtures and trim.
 - 6. Hose Bibbs.
 - 7. Vent flashing.
 - 8. Testing and adjustment of the Plumbing Systems.

9. Other items as may be specified or shown on the Drawings.

1.4 WORKMANSHIP

- A. Where other instructions are not given, equipment shall be installed in accordance with the recommendations of the manufacturer and the best standard practice for this type of work.

1.5 DRAWINGS

- A. The Drawings form a part of this specification and contract, and any work or material shown on the Drawings and not mentioned in the Specifications, or vice versa, shall be executed the same as if specifically mentioned in both. The work shall be installed as indicated on the Drawings; however in certain instances, arrangements are schematic, indicating only general arrangements. Should it be necessary to deviate from the arrangement shown in order to meet structural conditions, such additions shall be made without expense to the Owner.
- B. The data given herein and on the Drawings is as exact as could be secured, but extreme accuracy is not assured. The Drawings and Specifications are for the assistance of the Contractor; exact locations, distances, elevations and levels must be established by the Contractor, who shall accept the Contract with this understanding.
- C. Whenever there appears to be a discrepancy between Drawings and/or specifications, the Contractor shall base his bid on the most expensive alternate, and after award of Contract, shall consult the Architect for further instructions.

1.6 RULES, REGULATIONS, AND CODES

- A. All work and materials shall be in full accordance with the latest codes, rules, and regulations of the following:
1. National Fire Protection Association.
 2. Part - 5, T-24 California Code of Regulations.
 3. State Health Department.
 4. State Industrial Accident Commission's Safety Orders.
 5. Rules of Local Utility.

- 6. California Mechanical Code.
- 7. California Building Code.
- 8. California Plumbing Code.
- 9. California Electric Code.
- B. Rulings and interpretations of the enforcing agency will be considered part of the regulations.
- C. Nothing in these Specifications is to be construed to permit work not conforming to the above, and expense in compliance with the above shall be borne by the Contractor.
- D. Whenever the Specifications and Drawings require higher standards or larger sizes than those required by the ordinances and statutes, the Specifications and Drawings shall take priority over the specific ordinances and statutes.

1.7 SITE EXAMINATION AND CONDITIONS

- A. This Contractor shall examine the site, verify dimensions and locations against the Drawings and inform himself of all conditions under which work is to be done before submitting his Proposal. No allowance will be made in his behalf for extra expense on account of error.

1.8 AS BUILT DRAWINGS

- A. Supplementing the requirements of the General Conditions and Supplementary General Conditions, As-built drawings shall show invert elevations of sanitary sewers, rain water leaders and storm sewers of critical locations, locations of shut-off valves and stub-outs for future, and all changes made during the course of the work. Furnish reproducible Drawings when work is complete.
- B. The grade or quality of materials desired is indicated by the trade names or catalog numbers stated herein.
- C. Dimensions, sizes, and capacities shown are a minimum and shall not be changed without permission of the Architect.

1.9 MATERIAL LIST AND SUBSTITUTIONS

- A. Prior to commencement of work, and within 35 days after signing of the Contract by the Owner and General Contractor, this Contractor shall submit in quintuple to the Architect for approval a complete list of equipment and materials to be furnished, including all substitutions. Partial or incomplete lists of materials will not be considered. No substitutions will be considered thereafter. Only one (1) request for substitution will be considered on each item of material or equipment.
- B. If the Contractor desires to make a substitution, he shall submit complete information or catalog data to show the equality of the equipment or material offered to that specified. No substitution will be allowed unless requested and approved in writing. Materials of equal merit and appearance in the opinion of the Architect will be approved for use. Architect reserves the right to require originally specified item.
- C. Installation of approved substitution is the Contractor's responsibility. Any changes required for installation of approved substituted equipment must be made without additional cost.
- D. Submit to Architect for approval, within a reasonable time after award of contract and in ample time to avoid delay of construction, shop drawings or submittals on all items of equipment and materials covered in list mentioned above. Shop drawings shall be submitted in five (5) copies and in a complete package. Partial submittals will not be considered.

1.10 FEES, PERMITS, AND UTILITY SERVICES

- A. This Contractor shall arrange to obtain and to pay for all permits and service charges required in the installation of his work, arrange for required inspections, and secure approvals from authorities having jurisdiction. Contractor shall arrange for utility connections and pay charges incurred, including excess Service charges, if any.

1.11 GUARANTEE

- A. The Contractor shall be responsible for all work done and materials installed under these Plans and Specifications.
- B. The Contractor shall repair or replace, as may be necessary, at his expense, any defective work, material, or part which may show itself within one (1) year of the date of filing of Notice of Completion, and be responsible for all damage to other materials, furnishings, equipment, or premises caused by such defects during this period if, in the opinion of the Architect, said defect is due to imperfection of materials or workmanship.

PART 2 - PRODUCTS

2.1 SOIL, WASTE, VENT AND DRAINAGE PIPING

- A. Underground Piping to 5 Feet Outside Building Line: ABS plastic.
- B. Aboveground Piping: "No-Hub" cast iron soil pipe and fittings with standard-duty stainless steel couplings and neoprene gaskets.
- C. Aboveground Piping - Top Two Floors: ABS plastic.

2.2 DOMESTIC WATER PIPING

- A. CPVC Piping:
 - 1. Corzan Flow Guard Gold ASTM D2846, ASTM F402, ASTM F437, ASTM F439. Install CPC requirements with any special local amendments.

2.3 PRIMER PIPING

- A. Above Ground: Type "L" hard-drawn copper tubing with wrought sweat fittings and soldered joints.
- B. Below Ground: Type "L" soft annealed copper tubing with wrought sweat fittings and brazed joints.

2.4 POTABLE HOT AND COLD WATER DISTRIBUTION SYSTEM within apartment units, using crosslinked polyethylene (PEX) tubing and ASTM f1960 cold expansion fittings (Typical of piping within apartment units.):

- A. Design Requirements:
 - 1. Standard grade hydrostatic pressure ratings from Plastics Pipe Institute (PPI) in accordance with TR-3 as listed in TR-4. The following three standard-grade hydrostatic ratings are required.
 - a. 200°F at 80 psi
 - b. 180°F at 100 psi
 - c. 73.4°F at 160 psi

2. Certification of flame spread/smoke development rating of 25/50 in accordance with ASTM E84 provided the installation meets one of the following requirements.
 - a. Tubing spacing is a minimum of 18 inches apart for the following sizes.
 - 1) 3/8"
 - 2) 1/2"
 - 3) 5/8"
 - 4) 3/4"
- B. Performance Requirements: To provide a PEX tubing hot and cold potable water distribution system, which is manufactured, fabricated and installed to comply with regulatory agencies and to maintain performance criteria stated by the PEX tubing manufacturer without defects, damage or failure.
 1. Comply with ANSI/NSF Standard 14.
 2. Comply with ANSI/NSF Standard 61.
 3. Show compliance with ASTM F877.
 4. Show compliance with ASTM E119 and ANSI/UL 263 through certification listings with Underwriters Laboratories, Inc. (UL).
 - a. UL Design No. L557: 1 hour wood frame floor/ceiling assemblies.
 - b. UL Design No. K913: 2 hour concrete floor/ceiling assemblies.
 - c. UL Design No. U372: 1 hour wood stud/gypsum wallboard wall assemblies.
 - d. UL Design No. V444: 1 hour steel stud/gypsum wallboard wall assemblies.
- C. Submittals:
 1. General: Submit listed submittals in accordance with Conditions of the Contract and Division 1 Submittal Procedures Section.
 2. Product Data: Submit manufacturer's product submittal data and installation instructions.
 3. Samples: Submit selection and verification samples of tubing.

4. Quality Assurance/Control Submittals: Submit the following:
 - a. Test Reports: Upon request, submit test reports from recognized testing laboratories.
 - b. Certificates: Submit the following:
 - 1) Manufacturer's certificate that products comply with specified requirements.
 - 2) Certificate indicating that the installer is authorized to install the manufacturer's products.
5. Closeout Submittals: Submit the following:
 - a. Warranty documents specified herein.
 - b. Operation and maintenance data.
- D. Quality Assurance:
 1. Installer Qualifications: Use an installer with demonstrated experience on projects of similar size and complexity and possessing documentation proving successful completion of PEX plumbing installation training by the PEX tubing manufacturer.
 2. Regulatory Requirements and Approvals: Provide domestic potable system that complies with requirements of the following:
 - a. International Code Conference (ICC) – International Plumbing Code (IPC)
 - 1) ICC Evaluation Service (ES) Evaluation Report No. ESR 1099
 - b. Building Officials and Code Administrators International (BOCA)
 - 1) 1993 BOCA National Plumbing Code
 - c. California Plumbing Code (CPC)
 - 1) IAPMO Files 3558, 3946 and 3960
 - d. National Standard Plumbing Code (NSPC)
 - e. HUD Material Release No. 1269

3. Certifications: Provide letters of certification as follows:
 - a. Installer is trained by the PEX tubing manufacturer to install the PEX potable water distribution system.
 - b. Installer will use skilled workers holding a trade qualification license or equivalent, or apprentices under the supervision of licensed trades professional.
4. Delivery, Storage and Handling:
 - a. General: Comply with Division 1 Product Requirement Section.
 - b. Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.
 - c. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
 - d. Storage and Protection: Store materials protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by the manufacturer.
 - 1) Store PEX tubing in cartons or under cover to avoid dirt or foreign material from being introduced into the tubing.
 - 2) Do not expose PEX tubing to direct sunlight for more than 30 days. If construction delays are encountered, provide cover to portions of tubing exposed to direct sunlight.
5. Warranty: Uponor offers a limited warranty of up to 25 years for its Wirsbo AQUAPEX® tubing and Wirsbo hePEX™ tubing and ProPEX® Fittings when installed by an Uponor-trained contractor and certified plumbing professional. See www.uponor-usa.com for details in the Customer Service section.
6. Products:
 - a. Hot and Cold Potable Water Distribution System:
 - 1) Manufacturer: Uponor. Contact: 5925 148th Street West, Apple Valley, MN 55124; Toll free (800) 321-4739, (952) 891-2000; Fax: (952) 891-2008; website: www.uponor-usa.com
 - b. Product Substitutions: Substitutions: No substitutions permitted.

c. Materials:

1) Tubing:

- a) Material: Crosslinked polyethylene (PEX) manufactured by PEX-A or Engel method.
- b) Type: Wirsbo AQUAPEX.
- c) Material Standard: Manufactured in accordance with ASTM F876 and ASTM F877 and tested for compliance by an independent third party agency.
- d) Standard grade hydrostatic design and pressure ratings from PPI.
- e) Fire-rated assembly listings in accordance with ANSI/UL 263.
 - (1) UL Design No. L55: 1-hour wood frame floor/ceiling assemblies.
 - (2) UL Design No. K913: 2-hour concrete floor/ceiling assemblies.
 - (3) UL Design No. U372: 1-hour wood stud/gypsum wallboard wall assemblies.
 - (4) UL Design No. V444: 1-hour steel stud/gypsum wallboard wall assemblies.
- f) Minimum Bend Radius (cold bending): No less than six times the outside diameter. Use a bend support as supplied by the PEX tubing manufacturer for tubing with a bend radius less than stated.
- g) Nominal Inside Diameter: Provide tubing with nominal inside diameter, in accordance with ASTM F876 as indicated.
 - (1) 3/8"
 - (2) 1/2"
 - (3) 3/4"
 - (4) 1"
 - (5) 1-1/4"
 - (6) 1-1/2"

(7) 2"

2) Fittings:

- a) Material: Fitting assembly is manufactured from material listed in paragraph 5.1 of ASTM F1960.
- b) Material Standard: Comply with ASTM F1960.
- c) Type: PEX-a cold expansion fitting.
 - (1) Assembly consists of the appropriate ProPEX insert with a corresponding ProPEX ring.

3) Manifolds:

- a) Material:
 - (1) Type L copper body with UNS 3600 series brass ProPEX outlet connections.
 - (2) Engineered Plastic (EP) body with ProPEX outlet connections.
- b) Manifold Type:
 - (1) Uponor ProPEX 1" copper manifold.
 - (2) Uponor engineered plastic (EP) manifold.
- c) All manifolds manufactured with the appropriate-sized ProPEX fittings on the manifold supply inlets.

4) Accessories:

- a) Angle stops and straight stops that are compatible with PEX tubing are supplied by the PEX tubing manufacturer.
- b) Bend supports designed for maintaining tight radius bends are supplied by the PEX tubing manufacturer.
- c) ProPEX expander tool to install the ASTM F1960 compatible fittings are supplied by the PEX tubing manufacturer.
- d) The tubing manufacturer provides clips and/or PEX rails for supporting tubing runs.

- e) All horizontal tubing hangers and riser clamps are epoxy-coated material.

7. Execution:

- a. Manufacturer's Instructions: Comply with manufacturer's product data, including product technical bulletins, installation instructions, design drawings and the Uponor Professional Plumbing Installation Guide.

- b. Examination:

- 1) Site Verification of Conditions:

- a) Verify that site conditions are acceptable for installation of the PEX potable water system.
 - b) Do not proceed with installation of the PEX potable water system until unacceptable conditions are corrected.

- c. Installation:

- 1) Wirsbo AQUAPEX Tubing:

- a) Install Wirsbo AQUAPEX tubing in accordance with the tubing manufacturer's recommendations and as indicated in the installation handbook.
 - b) Do not install PEX tubing within 6 inches of gas appliance vents or within 12" of any recessed light fixtures.
 - c) Do not solder within 18" of PEX tubing in the same waterline. Make sweat connections prior to making PEX connections.
 - d) Do not expose PEX tubing to direct sunlight for more than 30 days.
 - e) Ensure no glues, solvents, sealants or chemicals come in contact with the tubing without prior permission from the tubing manufacturer.
 - f) Use grommets or sleeves at the penetration for PEX tubing passing through metal studs.
 - g) Protect PEX tubing with sleeves where abrasion may occur.
 - h) Use strike protectors where PEX tubing penetrates a stud or joist and has the potential for being struck with a screw or nail.

- i) Use tubing manufacturer-supplied bend supports where bends are less than six times the outside tubing diameter.
 - j) Minimum horizontal supports are installed not less than 32" between hangers in accordance with model plumbing codes and the installation handbook.
 - k) PEX riser installations require epoxy-coated riser clamps installed at the base of the ceiling per floor.
 - l) A mid-story support is required for riser applications.
 - m) Pressurize Wirsbo AQUAPEX tubing with air in accordance with applicable codes or in the absence of applicable codes to a pressure of 25 psi above normal working pressure of the system.
 - n) Comply with safety precautions when pressure testing, including use of compressed air, where applicable. Do not use water to pressurize the system if ambient air temperature has the possibility of dropping below 32°F.
- 2) Through-penetration Firestop:
- a) Ensure compliance of one- and two-hour rated through penetration assemblies in accordance with ASTM E814.
 - b) A list of firestop manufacturers that list PEX tubing with their firestop systems is available from the PEX tubing manufacturer.
- 3) Related Products Installation: Refer to other sections listed in Related Sections paragraph herein for related products installation.
- d. Field Quality Control: Manufacturer's Field Services: Provide manufacturer's field service consisting of product use recommendations and periodic site visit for inspection of product installation in accordance with manufacturer's instructions.
- e. Cleaning:
- 1) Remove temporary coverings and protection of adjacent work areas.
 - 2) Repair or replace damaged installed products.
 - 3) Clean installed products in accordance with manufacturer's instructions prior to owner's acceptance.

4) Remove construction debris from project site and legally dispose of debris.

f. Protection: Protect installed work from damage due to subsequent construction activity on the site.

2.5 CONDENSATE DRAIN PIPING

A. CPVC

2.6 PIPE INSULATION

- A. Hot water supply piping above slab or ground except exposed runouts to fixtures and unions and valves shall be covered with 1" thick insulation for pipe 1/2" and 3/4" in diameter, and 1" in diameter and larger shall be covered with 1-1/2" thick insulation. The insulation shall be Johns-Manville Flame-Safe; one piece construction pre-formed fiberglass pipe insulation, with a "K" factor of .22 maximum at 75 degrees mean temperature.
- B. Provide GVB glass cloth vapor barrier on all exposed piping and VB vapor barrier on all concealed piping. Jacket to be secured per manufacturer's instructions.
- C. Fittings shall be covered with Johns-Manville Uni-Fit; pre-molded one-piece PVC insulated fitting covers. Proper factory pre-cut unifit insulation shall be applied to the fitting all per manufacturer's instructions. Do not insulate piping buried below slab.
- D. Provide insulation on the hot water line and waste for the handicap lavatory in accordance with the handicap Code Title 24 and as scheduled on the construction documents.
- E. The insulation product shall have a maximum flame spread of 25, and smoke production of 50.

2.7 DIELECTRIC UNIONS

- A. Connections, joints, and like connections at water heaters, equipment, etc., shall be provided with dielectric unions or couplings, Vallett or Epco. At the Contractor's option, galvanized steel pipe with galvanized malleable iron fittings may be used in place of copper pipe.

2.8 FLOOR, WALL, AND CEILING PLATES

- A. All pipes passing through floors, finished walls, or finished ceilings shall be fitted with chromium plated wall and floor plates, Beaton Cadwell #3.

2.9 PIPE SLEEVE

- A. Where pipes pass through concrete floors or walls, install galvanized metal or plastic sleeves having not less than 1/2" or more than 1" clearance around all sides of the pipe or pipe covering for the full thickness of the concrete. Sleeves shall be "Adjustocrete", or Sperzel "Crete-Sleeve".
 - 1. These sleeves shall be secured to metal or wood forms in such a manner that they will not become displaced during pouring of concrete. Sleeves on decks shall be filled with sand. After forms have been removed from concrete, sleeves shall be removed from the openings.
 - 2. The space between pipe and sleeves shall be caulked with oakum and mastic for openings through floors or walls below grade and made watertight.
 - 3. Sleeves for pipe sizes 1/2" to 3" shall be 26 gauge. Sleeves for pipe sizes 3-1/2" or larger shall be 24 gauge.

2.4 PIPE FLEX CONNECTIONS

- B. Provide flexible expansion loops of size and material noted on the drawings.
 - 1. Flexible loops shall be designed to impart no thrust loads on the anchors.
 - 2. The loop shall consist of two flexible sections of hose and braid, two 90 degree elbows, and a 180 degree return.
 - 3. Loops shall be installed in a neutral, pre-compressed, or pre-extended condition as required for application.
 - a. Loops installed hanging down shall have a drain plug. Loops installed straight up may be fitted with an automatic air release valve to purge air from the high point of the loop. Loops installed in any position other than hanging down must have the 180 degree return supported.
 - b. Install Flexonics within four-pipe diameters, both upstream and downstream, from a pipe guide or anchor.
 - 4. Flex connection shall accommodate 5-1/4" of seismic settlement.

2.10 PIPE HANGERS

- A. Pipe Hangers shall be rod with adjustable "J" hanger or iron type complete with rods, turn buckles, and brackets, clips, or concreted inserts. Hangers shall have means of vertical adjustment for leveling of lines after piping is in place.
 - 1. Hanger shall be Grinnell or B-Line Figure B3690/B3173, sized as required or as detailed. Other types, B-Line shall be used to suit specific conditions. Special hanging or support details shall be as shown on the Drawings.
 - 2. All pipe runs shall be installed and so supported that they may expand or contract freely without strain to pipe or permit longitudinal movement due to temperature changes without bending. Piping shall also be supported for earthquake all as shown on the Drawings.
- B. Horizontal steel piping shall have hangers or supports every 10' except that piping 1" in diameter and under shall have hangers or support every 6'.
- C. Horizontal cast-iron No-Hub piping shall have hangers or supports for each pipe length; 5' maximum intervals between supports.
- D. Spacing of hangers or supports for copper tubing shall be 8'-0" for pipe 1-1/4" in diameter or larger 5'-0" for small sizes.
- E. Branches from all lines shall have separate supports. No branch 6' in length or longer shall be installed without a hanger.
- F. All piping shall be firmly held in place. No piping shall be supported by wire, rope, wood, perforated tape, or other makeshift devices. Hanger rods shall be fastened to structural members or as otherwise directed. Hangers on insulated piping shall be installed in a manner which will not produce damage to insulation. Provide piping covering protection shields as required. Hangers on piping shall be completely around the insulation. Shields shall consist of 270 degrees of arc of 11 gauge galvanized sheet metal, 19" long, on bottom of insulation (see Detail).
- G. Pipe hangers for dissimilar metals (copper/galvanized) shall be provided with plastic coated hanger or the pipe shall be wrapped with 10 mil plastic tape.
- H. Strap water piping with copper clad straps, with felt insulators in walls to prevent vibration and noise.

2.11 UNION

- A. Unions shall be furnished and installed at each threaded or soldered connection to all equipment, tanks, valves, etc.
- B. Unions shall be located so that piping can easily be disconnected for removal of equipment, tank or valve and shall be of type specified in the following schedule:

<u>Type of Pipe</u>	<u>Union</u>
Steel pipelines, 2" and smaller	150 lb. screwed malleable ground joint, brass to iron seal; black for black pipe lines, galvanized for galvanized lines.
Screwed black or galvanized sizes 2-1/2" or larger	125 lb. cast iron screwed flanged union, flat faced full faced gasket, black for black pipe lines, galvanized for galvanized lines.
Copper tubing, 2-1/2" and smaller	Brass ground joint sweat connections.
Copper tubing, 2-1/2" and larger	150 lb. cast bronze, flat faced flange with silver brazing threadless ends.

2.12 CLEANOUTS

- A. General: Locate cleanouts as shown on Drawings and as required by local code. Cleanouts same size as pipe except that greater than 4 inches will not be required. Plastic components not allowed, except unless specifically noted.
- B. Types:
1. Tile Floor Cleanouts: J. R. Smith 4020-U with round heavy-duty nickel bronze top, taper thread, ABS plug and standard screws.
 2. Carpeted Floor Cleanout: J. R. Smith 4020-[U]-X with carpet clamping frame with round heavy-duty nickel bronze top, taper thread, ABS plug, carpet clamping device and standard screws.
 3. Concrete Floor Cleanout (General): J. R. Smith 4020 with round heavy-duty nickel bronze top, taper thread and ABS plug with standard screws.
 4. Concrete Floor Cleanout (Heavy Load): Same as for "General" locations, Item 3 above, except J. R. Smith 4100.

5. Wall Cleanout: J. R. Smith 4472-U, countersunk bronze taper thread plug, stainless steel shallow cover and vandal-proof screws.
 6. Outside Area Walks and Drives: J. R. Smith 4023-U with round heavy-duty nickel bronze top, taper thread, ABS plug and top secured with vandalproof screws. Install in 18" x 18" x 6" deep concrete pad flush with grade.
- C. Manufacturers: J. R. Smith, Zurn, Wade, or Watts. J. R. Smith model numbers used as a basis of selection.

2.13 VALVES

- A. General:
1. End Connections: Mate with pipe, tube and equipment connections. Where more than one type is indicated, selection is installer's option.
 2. Sizes: Unless otherwise indicated, provide valves of same size as upstream pipe sizes.
- B. Service:
1. Domestic Hot and Cold Water Shutoff and Isolation Valves:
 - a. Pipe Sizes 2-1/2" and Smaller: Ball valve.
 - b. Pipe Sizes 3" and Larger: Gate valve.
 2. Drain Service; Pipe Sizes: Drain valves.
 3. Strainer Blow-Off: Ball valve.
 4. Bypass Around Pressure-Reducing Valves: Globe valves.
 5. Check Valves Other than Pump Discharge: Swing check.
- C. Relief Valve: ASME code approved pressure and temperature relief valve. Run full size pipe to floor drain, or as noted otherwise. Cash-Acme or Watts.

2.14 PRESSURE REGULATING VALVES

- A. Water: Bronze body, diaphragm or piston type, spring actuated, with separate or integral strainer, pressure range to suit conditions, code approved for potable water

use. Provide shutoff valves, pressure relief valves, unions, drain valve and bypass in accordance with code requirements. Cash-Acme, Watts, Wilkins, or Mueller.

- B. Water: Automatic control pressure regulating valve, stainless steel seat, stem and spring, diaphragm actuated with brass body, hydraulic control pilots with effluent operating temperature range 32°F to 180°F, FDA and AWWA approved.
- C. Water: Bronze body construction, stainless steel strainer screen, thermal expansion bypass with renewable stainless steel seat and high temperature resisting diaphragm. Watts, Febco, or Wilkins.

2.15 WATER HAMMER ARRESTORS (SHOCK ABSORBERS)

- A. Bellows-type, stainless steel casing and bellows, pressure rated, tested and certified in accordance with PDI WH-201. Manufacturers: Amtrol, Inc., J. R. Smith, Wade, or Zurn.
- B. Piston-type, copper, brass or stainless steel with O-ring piston, pressure rated, tested and certified in accordance with PDI WH-201. Manufacturers: PPP or Sioux Chief.

2.16 TRAP PRIMERS

- A. Trap seal primer valve with integral automatic antisiphon protection. Code approval required. Wade, Zurn, J. R. Smith, PPP, or as scheduled.

2.17 THERMOMETERS

- A. Three inch diameter bi-metal dial thermometer with stainless steel case, white dial, black numbers with 4-inch stainless steel stem and brass separable socket. Provide back or bottom connections as required. 0°F to 200°F range. Manufacturers: Weiss Model 3BMS, Palmer, Ashcroft, Terice, Marshalltown, or Weksler.

2.18 PRESSURE GAUGES

- A. Single-pointer gauge with 0 to 100 PSI range, 10 PSI intervals and 1 PSI increments intermediate graduations. Aluminum dial with 1 percent accuracy and low bottom connections for wall mounting. Manufacturers: Weiss, Palmer, Marshalltown, Terice, Ashcroft, Weksler, or U.S. Gauge.

2.19 BACKFLOW PREVENTERS

- A. General: Provide shutoff valve and unions upstream and downstream of backflow preventers. Provide bronze "Y" strainer upstream of backflow preventers. Note: For hot water applications of 140°F or greater, provide backflow preventer rated for temperature of hot water system serving.
- B. Atmospheric Vacuum Breaker: Watts Model 288A with Watts 777S "Y" strainer. Febco, or Wilkins.
- C. Pressure Vacuum Breaker: Watts Model 800MCQT with 777S "Y" strainer. Febco, Wilkins, or Conbraco.
- D. Double Check Backflow Preventer: Watts Model 007QT Series with strainer, Febco, Wilkins, or Conbraco.
- E. Reduced Pressure Backflow Preventer: Watts Model 909QT Series with strainer. Febco, Wilkins, or Conbraco. Provide with air gap fitting and indirect drain piping to drain.

2.20 WATER VALVE BOXES

- A. Rectangular concrete valve box with cast iron hinged locking access cover (traffic rated), labeled "water." Provide size adequate for depth, maintenance accessibility for valve assembly, and the like. Provide extensions as required. Manufacturers: Brooks Products Model 36-HFL.

2.21 PREMANUFACTURED COUNTER-FLASHINGS

- A. Factory-fabricated counter-flashing constructed from Schedule 40 galvanized steel or galvanized malleable iron pipe coupling with tapered threads and 3 lb. lead sheet lead formed and soldered to coupling to produce counter-flashing minimum of 4" overlap over roof flashings. Provide for pipe sizes as required. Manufacturers: A&B Sheetmetal, 503-254-5581.

2.22 WATER HEATERS

- A. Heater: Factory equipped to operate without a storage tank. Provide heater with a proper sized bronze fitted circulating pump attached to an external circulating manifold which is fabricated and installed as an integral part of the heater.
- B. The water heater bears the ASME 'H' stamp and be National Board listed for 160 psi working pressure. Enclose the combustion chamber by high temperature, spall proof refractory, of modular interlocking construction for ease of replacement. Construct

water heater with a 16 gauge jacket, galvanized inside and outside and protected with a three-coat acrylic finish. Water heater to have built-in draft diverter contained entirely without the jacket and requiring no additional external draft hood devices.

- C. Equip water heater with a factory installed and wired circulating pump of sufficient capacity to ensure scale-free heater performance, typical of clubhouse.
- D. Pump: Bronze fitted and 120/60/1 (unless otherwise specified), typical of clubhouse.
- E. Manufacturers: As specified.

2.23 CIRCULATION PUMPS

- A. General: Provide in-line factory tested pumps, cleaned, and painted with enamel prior to shipment. Provide pumps of same type by same manufacturer.
- B. Type: Horizontal, oil-lubricated, designed for 125 PSI working pressure, 210°F continuous water temperature.
- C. Body: Bronze or stainless steel construction.
- D. Shaft: Steel, ground and polished, integral thrust collar.
- E. Bearings: Two horizontal sleeve bearings designed to circulate oil.
- F. Seal: Mechanical, with carbon seal face rotating against ceramic seat.
- G. Motor: Non-overloading at any point on pump curve, open, drip-proof, sleeve bearings, quiet operating, rubber mounted construction, built-in thermal overload protection.
- H. Coupling: Self-aligning, flexible.
- I. Manufacturers: As specified.

2.24 EXPANSION TANKS

- A. Manufacturers: Mueller, Amtrol, Armstrong, Taco, Bell & Gossett, or Watts.
- B. Welded steel, constructed, tested and stamped in accordance with IAPMO Standards for working pressure of 125 PSI. Support floor mounted tanks with steel legs or base. Provide single flexible diaphragm securely sealed into tank to separate air charge from system water, to maintain design expansion capacity. Provide pressure gauge

and air-charging fitting, and drain fitting. Diaphragm: Removable and replaceable in line.

2.25 CHINA FIXTURES

A. See Schedule.

2.26 STAINLESS STEEL FIXTURES

A. See Schedule.

2.27 MOLDED RESIN OR STONE FIXTURES

A. See Schedule.

2.28 ENAMELED STEEL FIXTURES

A. See Schedule.

2.29 ENAMELED CAST IRON

A. See Schedule.

2.30 FIBERGLASS FIXTURES

A. See Schedule.

2.31 ELECTRIC WATER COOLERS/FOUNTAINS

A. See Schedule.

2.32 FLUSHOMETERS

A. See Schedule.

2.33 FAUCET FITTINGS

A. Private: See Schedule.

B. Public: See Schedule.

2.34 WATER CLOSET SEATS

A. See Schedule.

2.35 FLOOR DRAINS

A. Cast iron body, double drainage flange with weep holes, nickel bronze or heavy C.P. strainer/grate/funnel finishes, flashing clamp device, adjustable or insert type strainer. Comply with ANSI A112.21.1. Smith, Wade, Watts, or Zurn. See Schedule on Drawings.

2.36 FLOOR SINKS

A. Coated or enameled cast iron body, double drainage flange with weep holes, nickel bronze or heavy C.P. strainer/grate/funnel finishes, flashing clamp device, adjustable or insert type strainer. Comply with ANSI A112.21.1. Smith, Wade, Watts, or Zurn. See Schedule on Drawings. (Plastic components not allowed.)

2.37 ROOF DRAINS/OVERFLOW ROOF DRAINS

A. Cast iron body, flashing ring, drain receiver, cast iron dome and underdeck clamp. Same manufacturer as floor drains. Comply with ANSI A112.21.2. J. R. Smith, Watts, Wade, or Zurn. See Schedule on Drawings for type. (Plastic components not allowed.)

2.38 HOSE BIBBS

A. Cast brass heavy duty hydrant, brass operating parts, renewable seat, hose outlet, vacuum breaker and removable "T" handle. J. R. Smith, Woodford, Wade, Zurn, Mifab, or Chicago. See Schedule on Drawings for types.

2.39 GARBAGE DISPOSERS

A. First grade quality suitable for commercial or residential kitchen use, complete with switches, controls, solenoid and flow control valves, vacuum breakers and

appropriate sink or cone attachments. Motors, switches, solenoid valves and electrical controls compatible. In-Sink-Erator. See fixture schedule for description.

2.40 FIXTURE TRIM

- A. Traps: Provide traps on fixtures except fixtures with integral traps. Exposed traps chromium plated cast brass or 17 gauge chromium plated brass tubing. American Standard, Kohler, Chicago, BrassCraft, Eastman, Speedway, or McGuire.
- B. Supplies and Stops: First quality, chrome plated with brass stems. Stops: Loose key type. American Standard, Kohler, Chicago, BrassCraft, Eastman, Legend, Speedway, or McGuire.

2.41 FIXTURE SCHEDULE

- A. Provide fixtures as scheduled on the Drawings.

2.42 SHOWER VALVES

- A. See Schedule.

2.43 THERMOSTATIC MIXING VALVES

- A. See Schedule.

PART 3 - EXECUTION

3.1 CHLORINATION

- A. General: Upon completion of tests and necessary replacements, thoroughly flush and disinfect domestic water piping.
- B. Method: After thoroughly flushing system with water to remove sediment, fill system with a solution containing 50 parts per million of chlorine for not less than 24 hours or 200 parts per million of chlorine for not less than 3 hours. After retention, drain, reflush and return system to service.
- C. Certification: Provide copy of domestic water chlorination certificate in each operations and maintenance manual.

3.2 FIRESTOPPING PENETRATIONS IN FIRE-RATED WALL/FLOOR ASSEMBLIES

- A. Provide proper sizing when providing sleeves or core-drilled holes to accommodate the penetration. Firestop voids between sleeve or core-drilled hole and pipe passing through to meet the requirements of ASTM E814.
- B. Manufacturers: 3M, Hilti, or Proset.

3.3 PROTECTION

- A. Protect fixtures and equipment from damage. Replace damaged items with new.
- B. Keep pipe openings closed by means of plugs or caps to prevent the entrance of foreign matter. Protect piping, ductwork, fixtures, equipment and apparatus against dirty water, chemical or mechanical damage both before and after installation. Restore to its original condition or replace fixtures, equipment or apparatus damaged prior to final acceptance of the work.
- C. Protect bright finished shafts, bearing housings and similar items, until in service; no rust will be permitted.
- D. Cover equipment and materials stored on the job site or otherwise suitably protect at the direction of, and to the satisfaction of Architect. If coverings become torn, replace until the equipment is connected and operating.

3.4 PIPING SYSTEMS INSTALLATION

- A. Piping:
 - 1. General: Lay underground building drains beginning at low point of systems, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install required gaskets in accordance with manufacturer's recommendations for use of lubricants, cements, and other special installation requirements. Clean interior of piping of dirt and other superfluous materials as work progresses. Maintain swab or drag in line and pull past each joint as it is completed. Place plugs in ends of uncompleted piping at end of day or whenever work stops. Coordinate installation of piping below with structural components and other system installations.
 - 2. Install piping pitched to drain at minimum slope of 1/4" per foot (2%). Where this slope is impractical, slope at 1/4" per foot for pipes below 4" size, and 1/8" per foot (1%) for piping 4" and larger, with the approval of the local code authority.

3. Condensate Drain Piping at HVAC Units: Trap condensate drain for HVAC units in accordance with Detail on Plumbing Drawings.
 4. Seismic Restraint: Brace mechanical piping and plumbing equipment against lateral movement as detailed in document "Seismic Restraint Manual Guidelines for Mechanical Systems" as published by SMACNA.
 5. Rough-in Piping: Provide temporary caps or plugs at piping shown on Drawings to be roughed-in for future connections by others.
 6. Sanitary Waste and Storm Drain Piping: Slope at uniform grade of 1/4" per foot unless noted otherwise. Make changes in size with reducing and wye fittings. Run exposed piping parallel or perpendicular to building structure.
 7. Sanitary Waste Piping from Back-to-Back Water Closets: Provide individual rough-in piping for each back-to-back water closet, no common sanitary cross, double fixture or double combination wye and 1/8 bend fittings allowed.
 8. Vent Piping:
 - a. General: Horizontal runs free of drops and sloped to drainage system.
 - b. Vents-Through-Roof (VTRs): Provide flashing with counter-flashing at vent penetrations through roof, as detailed. Wherever vents run up near or inside of exterior walls, offset pipe at underside of roof deck to obtain minimum 5' clearance between parapet and roof penetration. Provide code required clearances between vent-through-roof and HVAC equipment on roof. VTR counter-flashings to have a manufactured rolled return bend with minimum 1" overlap; crimping by hand tools will not be allowed. On single ply vinyl or plastic type roofs, provide flashings as required by roof installer and manufacturer. On raised rib steel roofs, provide flashings as required by roof installer and manufacturer.
- B. Cleanouts: Install in aboveground piping and building drain piping as indicated, as required by code; at each change in direction of piping greater than 135°F; at minimum intervals of 100 feet; and at base of each vertical soil or waste stack. Install floor and wall cleanout covers for concealed piping. Select type to match adjacent building finish. Coordinate locations and types of cleanouts with Architect prior to installation.
- C. Equipment Connections:
1. Provide soil and waste piping runouts to plumbing fixtures and drains, with approved trap, of sizes indicated; but in no case smaller than required by code.

2. Locate piping runouts as close as possible to bottom of floor slab supporting fixtures or drains.
3. Piping Runouts to Fixtures: Provide hot and cold piping runouts to fixtures of sizes indicated, but in no case smaller than required by code.
4. Equipment Connections: Connect hot and cold water piping system to equipment as indicated, and comply with equipment manufacturer's instructions. Provide shutoff valve and union for each connection; provide drain valve on drain connection.

D. Domestic Water Distribution Piping:

1. Water Service Piping: Provide sleeve in foundation wall for water service entry; make entry watertight. Provide shutoff valve at water service entry inside building; pressure gauge, test tee with valve.
2. Water Hammer Arrestors: Install in upright position, in locations and of sizes in accordance with PDI WH-201, and elsewhere as indicated.
3. Group piping installations and valves where possible to obtain maximum practical use of available space.
4. Arrange locations of valves, unions, drains and other components to provide for ease of cleaning, operation, repair or service. Size access panels and locate to provide both acceptable proximity and working space for such devices.
5. Provide valves and shock arrestors where required by code and where otherwise indicated in Specifications and on Drawings.
6. Provide protection plates for piping installed in wood stud walls and other building substructures as required by code.
7. Wherever piping is installed in exterior walls, route on warm side of insulation and as close to inside wall finish as possible, as detailed.
8. Provide low point drains and shutoff valves as required. Provide valve boxes, access panels, and the like, for complete installation.
9. Hot and Cold Plumbing Pipes: Isolate hot and cold water piping in plumbing chases and walls behind plumbing fixtures, which are adjacent to occupied areas, from the structure by a piping isolator, Cush-A-Strip S-716, or a 6" section of 3/8" thick foamed plastic between the hanger and pipe. Contractor's Option: Acousto-Plumb System using plastic bushings.

E. Valves:

1. Sectional Valves: Install on each branch and riser, close to main, where branch or riser serves two or more plumbing fixtures or equipment connections, and elsewhere as indicated.
2. Shutoff Valves: Install on inlet of each plumbing equipment item, and on inlet of each plumbing fixture, and elsewhere as indicated.
3. Drain Valves: Install on each plumbing equipment item located to completely drain equipment for service or repair. Install at base of each riser, at base of each

rise or drop in piping system, and elsewhere where indicated or required to completely drain domestic water piping system.

4. Check Valves: Install on discharge side of each pump, and elsewhere as indicated.
5. Balancing Valves: Install in each hot water recirculating loop, and elsewhere as indicated.

F. Backflow Preventers:

1. Install where indicated, and where required by code. Where practical, locate in same room as equipment being protected.
2. Submit product cut sheets to the Architect for approval prior to purchase.
3. Install as close to wall as possible with clearances for access and maintenance as required by the Architect.
4. Coordinate exact location of installation and type of backflow device serving a particular piece of equipment with the Architect prior to purchase and installation.
5. Provide wall/floor brackets that are of fully welded, hot dipped galvanized construction, fabricated to meet field conditions. Mount backflow preventer to brackets using cadmium plated "U" type bolts and nuts.
6. Contact: Contact local water district/backflow specialist and request backflow installation literature. Install backflow devices per CEC and local water district/backflow specialist requirements.
7. Route waste piping from air gap waste fitting concealed within walls to point of air gap termination at indirect waste interceptor.

G. Pressure Regulating Valves: Provide inlet and outlet ball valves, and globe valve bypass. Provide pressure gauge on valve outlet.

H. Excavation and Backfill:

1. General: Perform necessary excavation and backfill required for installation of mechanical work. Repair piping or other work damaged by Contractor's operations.
2. Water: Keep excavations free of standing water. Reexcavate and fill back excavations damaged or softened by water or frost to original level with sand, crushed rock or other approved material at no expense to Owner.

3. Tests: During progress of work for compacted fill, Owner reserves right to request compaction tests made under direction of a testing laboratory.
4. Trench Excavation: Excavate trenches to necessary depth and width, removing rocks, unstable soil (muck, peat, and the like), roots and stumps. Excavation material is classified as "base fill" and "native." Base fill excavation material consisting of placed crushed rock may be used as backfill above "Pipe Zone." Remove and dispose off site native excavation material at no expense to Owner. Adequate width of trench for proper installation of piping or conduit.
5. Support Foundations:
 - a. Foundations: Excavate trenches located in unstable ground areas below elevation required for installation of piping to a depth which is determined by Architect as appropriate for conditions encountered. Place and compact approved foundation material in excavation up to "Bedding Zone." Dewatering, placement, compaction and disposal of excavated materials to conform to requirements contained in other sections of Specifications or drawings.
 - b. Over-Excavations: Where trench excavation exceeds required depths, provide place and compact suitable bedding material to proper grade or elevation at no additional cost to Owner.
 - c. Foundation Material: Where native material has been removed, place and compact necessary foundation material to form a base for replacement of required thickness of bedding material.

	Class A		Class B	
Material Passing	Min.	Max.	Min.	Max.
3/4" Square Opening	27	47	0	1

- d. Bedding Material: Full bed site piping on sand, pea gravel or 3/4" minus crushed rock. Place a minimum 4" deep layer of sand or crushed rock on leveled trench bottom for this purpose. Remove bedding to necessary depth for piping bells and couplings to maintain contact of pipe on bedding for its entire length. Provide additional bedding in excessively wet, unstable, or solid rock trench bottom conditions as required to provide a firm foundation.
6. Backfilling:
 - a. Following installation and successful completion of required tests, backfill piping in lifts.

- 1) In "Pipe Zone" place backfill material and compact in lifts not to exceed 6" in depth to a height of 12" above top of pipe. Place backfill material to obtain contact with entire periphery of pipe, without disturbing or displacing pipe.
 - 2) Place and compact backfill above "Pipe Zone" in layers not to exceed 12" in depth.
 - b. Backfill Material:
 - 1) Backfill Material in "Pipe Zone": 3/4" minus crushed rock, sand or pea gravel.
 - 2) Crushed rock, fill sand or other backfill material approved elsewhere in Specifications may be used above "Pipe Zone".
7. Compaction of Trench Backfill:
 - a. Where compaction of trench backfill material is required, use one of following methods or combination thereof:
 - 1) Mechanical tamper,
 - 2) Vibratory compacter, or
 - 3) Other approved methods appropriate to conditions encountered.
 - b. Architect to have right to change methods and limits to better accommodate field conditions. Compaction sufficient to attain 95 percent of maximum density at optimum moisture content unless noted otherwise on the Drawings or elsewhere in the Specifications. Water "puddling" or "washing" is prohibited.
- I. Testing:
 1. General:
 - a. Provide temporary equipment for testing, including pumps, compressors, tanks, and gauges, as required. Test piping systems before insulation is installed and remove or disengage control devices before testing. Where necessary, test sections of each piping system independently, but do not use piping valves to isolate sections where test pressures exceed local valve operating pressure rating. Fill each section with water, compressed air, or nitrogen and pressurize for the indicated pressure and time.

- b. Notify the Architect and local Plumbing Inspector two days before tests.
 - c. Drainage, Waste, and Vent Piping: Test in accordance with governing plumbing code or as follows: Test drainage and venting systems, with necessary openings plugged, to permit system to be filled with water and subjected to a water pressure of a minimum of 5 psi head. System shall hold water without a water level drop greater than 1/2 pipe diameter of the largest nominal pipe size within a 24 hour period. Test system in sections if the minimum head cannot be maintained in each section. The 5 psi head to be the minimum pressure at the highest joint.
 - d. Water Piping: Eliminate air from system. Fill and test at 125 psig or minimum 1-1/2 times static pressure at the connection to the serving utility main for a period of two hours with no loss in pressure.
 - e. Send test results to the Architect for review and approval.
2. Testing of Pressurized Systems:
- a. Test each pressurized piping system at 150% of the operating pressure indicated, but not less than 125 psig test pressure.
 - b. Observe each test section for leakage at end of test period. Test fails if leakage is observed or if pressure drop exceeds 2% of test pressure.
 - c. Test hot and cold domestic water piping systems upon completion of rough in and before connection to fixtures at a hydrostatic pressure of 125 psig.
3. Repair:
- a. Repair piping system sections which fail the required piping test by disassembly and reinstallation, using new materials to the extent required to overcome leakage. Do not use chemicals, stop-leak compounds, mastics, or other temporary repair methods.
 - b. Drain or purge test water, air, or nitrogen from piping system after testing and repair work have been completed.
- J. Water Hammer Arrestors (Shock Absorbers): Locate shock absorbers in supply pipe in accordance with recommendations of Plumbing and Drainage Institute PDI-WH201. Install ahead of solenoid operated valves. Determine size of absorber by fixture unit value of fixture supplied, using PDI symbols to designate sizes. Provide access panel for each shock absorber.

3.5 PAINTING AND IDENTIFICATION

A. Identification of pipe systems shall conform to American National Standard A13.1-1975.

1. All exposed piping and insulated piping systems furnished and installed under this work shall be completely painted and identified with the direction of flow and type of material indicated by means of legends and flow arrows, all as specified herein. The markings shall be applied after all painting, priming and cleaning of the piping and insulation is completed. Identification markers shall be applied at twenty foot intervals and at valve locations.
2. Paint: All exposed piping and insulated piping shall be provided with two coats consisting of Rustoleum paint with Federal safety coatings as scheduled below.
3. Piping painting schedule, legend, and paint type:

<u>Legend</u>	<u>Marker Black Letters/Code</u>	<u>Tentative Color</u>
Cold Water	SW/C15	Green
Tempered	TW/	Green
Soil & Waste	W/W2	Green
Acid Waste	ACID/A4	Yellow
Vents	V/V4	Green
Storm, Roof Drains	S/S12	Green
Condensate(AC Unit)	COND/C19	Green
Hot Water Supply	HW/D6	Yellow
Hot Water Recirc Ret	HWR/D6	Yellow
Fire Protection	F/S9	Red
Natural Gas	G/N1	Yellow
High Pressure Steam	HPS/H8	Yellow
Low Pressure Steam	LPS/H8	Yellow
Heating Water Supply	HWS/H14	Yellow
Heating Water Return	HWR/H13	Yellow
Condensate Return	COND.R/C27	Yellow
Boiler Feed	BFW/B4	Yellow
Instrument	AIR/14	Green
Medical Air	MED.AIR/A012	Black
Oxygen	OXY/03	Green
Nitrogen	NITROGEN/N2	Green
Nitrous Oxide	NITR.OXY/N2	Blue
Vacuum	VAC/Y2	White
Compressed Air	AIR/A012	Black

- B. The size, in inches, of the lettering and flow arrows shall be per American National Standard A13.1-1975, and shall be set mark pipe markers.

3.6 FIXTURES INSTALLATION

A. General:

1. Install plumbing fixtures of types indicated where shown and at indicated heights; in accordance with fixture manufacturer's written instructions, roughing-in drawings, and with recognized industry practices. Ensure that plumbing fixtures comply with requirements and serve intended purposes.
2. Verification of Conditions: Examine roughing-in work of potable water and waste piping systems to verify actual locations of piping connections prior to installing fixtures. Examine floors and substrates, and conditions under which fixture work is to be accomplished. Correct incorrect locations of piping and other unsatisfactory conditions for installation of plumbing fixtures.
3. Set and connect to soil, waste, vent and water piping in neat, finished and uniform manner. Connections to be equal height, plumb and set at right angles to floor, wall or both unless otherwise required or specified.
4. Seal fixtures mounted on floors and walls at abutting joints with approved sealant compounds as directed by the Architect.
5. For ADA accessible toilets, provide with handle at wide portion of stall.
6. Lavatories: Set mixing valves to limit outlet temperature to 110°F.

- B. Fixture Locations: As shown on the Drawings. Center water closets and urinals between privacy partitions unless noted otherwise.

- C. Stops: Stops installed in each supply pipe at each fixture accessibly located with stops of loose key type. Concealed stops to be screwdriver or loose key type with wall escutcheons.

D. Fixture Supports:

1. Support wall hung water closets, urinals and lavatories on heavy duty, full size, and concealed, commercial grade chair carriers mounted to floor structure. Refer to plumbing fixture connection schedule on drawings.
2. Support other fixtures mounted on stud partitions on heavy concealed wall brackets bolted to a 1/4" thick by 5" high steel plate anchored firmly to studs with

bolts (or welded to metal studs). Plate to extend one stud each way beyond fixture mounting point width.

- E. Flush Valves: Provide "drop-ear" ells or couplings in wall at water supply outlets to flush valves; anchor firmly to structure. At ADA accessible fixtures, face handle to wide portion of stall.
- F. After fixtures are set in place and secured to walls, caulk around between fixtures and wall with white silicone caulking compound. Dow Corning 780 or General Electric Construction Sealant.
- G. Set countertop lavatories and stainless steel sink rims in waterproof sealant made for application.
- H. Adjust self-closing faucets to provide minimum of 10 seconds of waterflow, and maximum of 15 seconds.
- I. After fixture installation is complete cover and protect rims, fronts, and exposed parts until completion of construction phase. Contractor to be responsible for damage to fixtures and assumes related fixture repair or replacement costs.
- J. Adjusting and Cleaning: Clean plumbing fixtures, trim, and strainers of dirt and debris upon completion of installation. Adjust water pressure at drinking fountains, faucets, shower valves and flush valves to provide proper flow stream and specified GPM. Repair leaks at faucets and stops.
- K. Extra Stock: Furnish special wrenches and other devices necessary for servicing plumbing fixtures and trim to Owner.
- L. Field Quality Control:
 - 1. Upon completion of installation of plumbing fixtures and after units are water pressurized, test fixtures to demonstrate capability and compliance with requirements. When possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units and proceed with retesting.
 - 2. Inspect each installed unit for damage to finish. If feasible, restore and match finish to original at site; otherwise, remove fixture and replace with new unit. Feasibility and match to be judged by the Architect. Remove cracked or dented units and replace with new units.
 - a. Adjusting and Cleaning: Clean piping exterior surfaces. Flush out water filled or drainage piping systems with clean water.

- b. Hose Bibb Piping: Provide each hose bibb with an individual accessible shutoff valve (ball type). Locate where shown on Drawings. Provide full access.

3.7 FLOOR DRAINS AND FLOOR SINKS

- A. General: Install drains in accordance with manufacturer's written instructions and in locations indicated.
- B. Coordinate with piping as necessary to interface drains with drainage piping systems.
- C. Install floor drains at low points of surface areas to be drained, or as indicated. Set tops of floor drains flush with finished floor. Set floor sinks as required by local codes.
- D. Install drain-flashing collar or flange so that no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
- E. Position drains so that they are accessible and easy to maintain.
- F. Coordinate drain flashing, flanges and strainer types and depths with floor substrate and topping configuration.
- G. Primers: Prime drains that experience intermittent use. Refer to the Drawings and coordinate location with the Architect.

3.8 ROOF DRAINS/OVERFLOW DRAINS

- A. General: Install drains in accordance with manufacturer's written instructions and in locations indicated.
- B. Coordinate metal flashing work with work of roofing, waterproofing, and adjoining substrate work.
- C. Coordinate with roofing as necessary to interface roof drains with roofing work.
- D. Coordinate with storm water piping as necessary to interface drains with drainage piping systems.
- E. Install drains at low points of surface areas to be drained.
- F. Install drains flashing collar or flange so that no leakage occurs between drain and adjoining roofing. Maintain integrity of waterproof membranes where penetrated.
- G. Position drains so that they are accessible and easy to maintain.

- H. Set overflow drains at proper elevation relative to main roof drains.

3.9 HOSE BIBBS (INSIDE)

- A. Install on exposed piping where indicated, with vacuum breaker.

3.10 HOSE BIBBS AND HYDRANTS

- A. Install where indicated, with vacuum breaker and in accordance with manufacturer's installation instructions.

3.11 CIRCULATING PUMPS

- A. Install per manufacturer's instructions.
- B. Adjust flow rate to design point.

3.12 CLOSING IN OF UNINSPECTED WORK

- A. This Contractor shall not allow or cause any of the work installed by him to be covered up or enclosed before it has been inspected, tested and approved.
- B. Should any of the work be enclosed or covered up before it has been approved, he shall, at his expense, uncover the work. After it has been tested, inspected, and approved, he shall make all repairs necessary to restore the work of other Contractors to the condition in which it was found at the time of cutting.

3.13 CARE AND CLEANING

- A. All broken, damaged, or otherwise defective parts of this work shall be repaired or replaced by this Contractor, at his expense, and the entire work left in a condition satisfactory to the Architect. At completion this Contractor shall carefully clean and adjust all equipment, fixtures, and trim which are installed as part of his work and the systems and equipment left in satisfactory operating condition.
- B. After flushing, entire water system from new points of connection shall be sterilized before being turned over to Owner for use. Slowly fill system with water and add chlorine agent to produce a minimum of 50 ppm of chlorine in entering water.

- C. Treated water shall be retained in pipe overnight. Chlorine residual at pipe extremities shall be at least 5 ppm at end of this time. Should chlorine residual be less than this amount, pipe shall be re-chlorinated. After chlorination, lines shall be flushed of chlorinated water and refilled from domestic supply. Flushing shall continue until residual is not greater than .02 ppm at all pipe extremities.

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HEATING, VENTILATING, AND AIR CONDITIONING (HVAC)

PART 1 - GENERAL

1.1 GENERAL CONDITIONS

- A. Requirements of the General and Special Conditions of these Specifications apply to all work. The Contractor shall consult them in detail and assume all obligations or conditions therein which affect this work.

1.2 SCOPE OF WORK

- A. This Contractor shall furnish all material and provide all labor, equipment, tools and services to complete the heating and air conditioning work as shown on the Drawings and as hereinafter described, ready for service to the entire satisfaction of the Architect.

1.3 WORK INCLUDED

- A. The work includes, in general, the following:
 - 1. Split system heat pump units.
 - 2. Air distribution supply & return ductwork, ceiling supplies, and returns.
 - 3. Exhaust system.
 - 4. Temperature control system, complete.
 - 5. Testing and adjusting of the complete system.
 - 6. Other items as may be specified or shown on the Drawings.

1.4 WORK NOT INCLUDED

- A. The following is not included in this particular work:
 - 1. Painting, except as herein specified.

2. Electrical Contractor shall provide all line voltage wiring, and all line voltage conduit, disconnects, and connect up all motors and smoke detectors complete. AC Contractor to provide wiring diagram as requested.

1.5 WORKMANSHIP

- A. Where other instructions are not given, equipment shall be installed in accordance with the recommendations of the manufacturer and the best standard practice for this type of work.

1.6 DRAWINGS

- A. The Drawings form a part of this specification and contract, and any work or material shown on the Drawings and not mentioned in the Specifications, or vice versa, shall be executed the same as if specifically mentioned in both. The work shall be installed as indicated on the Drawings; however in certain instances, arrangements are schematic, indicating only general arrangements. Should it be necessary to deviate from the arrangement shown in order to meet structural conditions, such additions shall be made without expense to the Owner.
- B. The data given herein and on the Drawings is as exact as could be secured, but extreme accuracy is not assured. The Drawings and Specifications are for the assistance of the Contractor; exact locations, distances, elevations and levels must be established by the Contractor, who shall accept the Contract with this understanding.
- C. Whenever there appears to be a discrepancy between Drawings and/or specifications, the Contractor shall base his bid on the most expensive alternate, and after award of Contract, shall consult the Architect for further instructions.

1.7 ORDINANCES AND REGULATIONS

- A. All work and materials shall be in full accordance with the latest codes, rules, and regulations of the following:
 1. National Fire Protection Association.
 2. Part - 5, T-24 California Code of Regulations.
 3. State Health Department.
 4. State Industrial Accident Commission's Safety Orders.

5. Rules of Local Utility.
6. California Mechanical Code.
7. California Building Code.
8. California Plumbing Code.
9. California Electric Code.

- B. Rulings and interpretations of the enforcing agency will be considered part of the regulations.
- C. Nothing in these Specifications is to be construed to permit work not conforming to the above, and expense in compliance with the above shall be borne by the Contractor.
- D. Whenever the Specifications and Drawings require higher standards or larger sizes than those required by the ordinances and statutes, the Specifications and Drawings shall take priority over the specific ordinances and statutes.

1.8 SITE EXAMINATION AND CONDITIONS

- A. This Contractor shall examine the site, verify dimensions and locations against the Drawings and inform himself of all conditions under which work is to be done before submitting his proposal. No allowance will be made in his behalf for extra expense on account of error.

1.9 AS-BUILT DRAWINGS

- A. Supplementing the requirements of the General Conditions and Supplementary General Conditions, As-Built Drawings shall show any changes made to the construction documents. Furnish reproducible Drawings when work is complete.
- B. The grade or quality of materials desired is indicated by the trade names or catalog numbers stated herein.
- C. Dimensions, sizes, and capacities shown are a minimum and shall not be changed without permission of the Architect.

1.10 MATERIAL LIST AND SUBSTITUTIONS

- A. Prior to commencement of work, and within 35 days after the signing of the contract by the Owner and General Contractor, this Contractor shall submit in quintuple to the Architect for approval a complete list of equipment and materials to be furnished, including all substitutions. Partial or incomplete lists of materials will not be considered. No substitutions will be considered thereafter. Only one (1) request for substitution will be considered on each item of material or equipment.
- B. If the Contractor desires to make a substitution, he shall submit complete information or catalog data showing the equality of the equipment or material offered to that specified. No substitutions will be allowed unless requested and approved in writing. Materials of equal merit and appearance in the opinion of the Architect will be approved for use. Architect reserves the right to require originally specified items.
- C. Installation of approved substitution is the Contractor's responsibility. Any changes required for installation of approved substituted equipment must be made without additional cost.
- D. Submit to Architect for approval, within a reasonable time after award of contract and in ample time to avoid delay of construction, shop drawings or submittals on all items of equipment and materials covered in list mentioned above. Shop Drawings and submittals shall be submitted in five (5) copies and in a complete package. Partial submittals will not be accepted.

1.11 FEES, PERMITS, AND UTILITY SERVICES

- A. This Contractor shall arrange to obtain and to pay for all permits and service charges required in the installation of his work, arrange for required inspections, and secure approvals from authorities having jurisdiction. Contractor shall arrange for utility connections and pay charges incurred, including excess Service charges, if any.

1.12 DAMAGE BY LEAKS

- A. This Contractor shall be responsible for all damage to any part of the premises caused by leaks or breaks in the work furnished and/or installed by him for a period of one (1) year after date of filing of Notice of Completion.

1.13 GUARANTEE

- A. This contractor shall be responsible for all work done and materials installed under these plans and specifications. Any defective work, material, or part which may show itself within one (1) year of the date of filing of Notice of Completion shall be repaired

or replaced by him, as may be necessary, and he is also responsible for all damages to other materials, furnishings, equipment or premises caused by such defects during this period if, in the opinion of the Architect, said defect is due to imperfection of materials or workmanship.

- B. Contractor shall replace refrigerant, lubricants, or gases lost as the result of defects, breaks or leaks in his work.

1.14 ACCESS

- A. This Contractor shall continuously check the Architectural Drawings for clearance and accessibility of the equipment specified herein to be placed. No allowance of any kind shall be made for negligence on the part of the Contractor to foresee means of installing his equipment into proper position inside the building.

1.15 SHOP DRAWINGS

- A. Submit descriptive data on all material and equipment including "as specified" items as well as proposed substitutions.
- B. Data on each item shall be marked with the applicable specification paragraph and any identifying mark from equipment schedules shown or specified.
- C. Certified Drawings showing fabrication details, complete dimensions, date of certification and all other pertinent information shall be submitted for approval for all items proposed as substitutions.
- D. Ductwork fabrication drawings shall be made available for all areas that have been modified from the original Drawings.

1.16 MAINTENANCE AND OPERATING INSTRUCTIONS

- A. Furnish the Owner with two copies of manuals, bound between hard covers and titled "AIR CONDITIONING", properly indexed and sectioned, operating sheets and parts list for each and every mechanical system and piece of equipment furnished under these specifications. Deliver same to Architect prior to work's completion.
- B. The "AIR CONDITIONING" materials shall be separated into three sections:
 - 1. Complete operating instructions: Including starting, stopping, and description of emergency manual operation methods for all individual diagrams for the air conditioning system.
 - 2. Maintenance Instructions: Covering under each item of individual equipment pertinent maintenance data such as lubricants to be used, frequency of lubrication, inspection required, adjustments, etc.
 - 3. Parts Bulletins: Containing manufacturer's bulletins with parts numbers, instructions, etc., for each item of equipment. Bulletins shall be properly stripped so that useless bulk is avoided.
- C. Service telephone numbers and/or addresses shall also be posted in an appropriate place as designated by the Architect.

1.17 WEATHERPROOFING

- A. Provide all equipment, ductwork, controls, motor, bearings, V-belts or other materials requiring protection from weather, when located outside of building with adequate

weatherproof protection. Obtain approval of Architect prior to installation of protection. Construct weatherproof protection to prohibit water from standing or puddling on equipment ductwork.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Materials will be specified herein and as indicated on Drawings and schedules.

2.2 DUCTWORK INSULATION

- A. Insulation applied to exterior surface of the ducts located in buildings shall have a flame spread of not more than 25 and a smoke-developed rating of not more than 50 when tested as a composite installation including insulation, facing materials, tapes and adhesives as normally applied.
- B. All insulation shall be applied by those who are licensed contractors in the insulation industry, who employ only skilled personnel.
- C. All diffuser boots, drops, and concealed supply and return ducts, unless indicated otherwise, shall be wrapped with 1-1/2" thick Manville, Fiberglas, or Manville Microlite fiberglass duct insulation lapped 4" and held in place by copper clad wire tied on 12" centers of 1/2" long staples on 2" centers. Before wrapping insulation around ducts, Contractor shall apply adhesive on all four sides of ducts to prevent sagging of insulation.
- D. Internal duct lining shall be provided on all exposed supply and return ducts and for a minimum distance of 10'-0" on fan inlet and elsewhere shown. It shall be Manville, Fiberglas, or Manville Microcoustic duct liner 1-1/2" thick unless noted otherwise with NFPA film facing. Adjust duct sizes to accommodate liner and to give new dimensions shown on Drawings. Cement lining in place with Foster's No. 85-20 non-flammable adhesive and fasten to sheet metal with Type B Stick-klips.
- E. Point up exposed edges and leading edges of all cross points of the liner with Benjamin Foster's 30-36 Seal-Fas adhesive.
- F. Duct seams shall be taped as hereinafter specified.
- G. All insulation shall be approved and bear UL stamp on the insulation material at 5'-0" intervals.

2.3 GALVANIZED SHEET-METAL DUCTWORK

- A. General: CMC Duct Construction Standards, latest edition, or latest edition of ASHRAE Guide Table. 1-1/2 ounce galvanizing per square foot, both sides.

2.4 FLEXIBLE DUCTS

- A. General: Comply with CMC, latest edition, Class 0 or Class 1.
- B. Flexible ducts are limited to Building #1 with maximum length of 5'-0".
- C. Standard factory fabricated product, construct an inner wall of impervious vinyl or chlorinated polyethylene, permanently bonded to a vinyl or zinc-coated spring steel helix. Cover the assembly with fiberglass blanket insulation covered by an outer wall of vinyl or fiberglass-reinforced metalized vapor barrier. UL 181 listed Class 1 flexible air duct material. Overall thermal transmission no more than 0.25 (BTU/in) / (hr/sq.ft./deg. F) at 75°F differential, per ASTM C335. Vapor transmission value no more than 0.10 perm, per ASTM E96. Rated for a minimum of 4-inch w.g. positive pressure and 1-inch w.g. negative pressure. Provide R-4.2 when in conditioned space and R-8.0 when in unconditioned space.
- D. Air friction correction factor of 1.3 maximum at 1000 FPM. Working air velocity of at least 2000 FPM. Flame spread rating no more than 25. Smoke development rating no more than 50 as tested per ASTM E84. Must have cataloged data on insertion loss characteristics, minimum attenuation of 29 DB for 10-foot straight length at 8-inch diameter and 500 Hz.
- E. Manufacturers: J. P. Lamborn Co., Norflex, Clevaflex, Genflex, Atco, Flexmaster, or Thermaflex.

2.5 FACTORY FABRICATED METAL ROUND AND FLAT OVAL DUCTWORK

- A. General: Provide per CMC Duct Construction Standards, latest edition, and ASTM A527 Class 0.
- B. Round sheet metal, spiral lock seam type. Fittings: Same construction as the duct. Tap in fittings not allowed. Duct sealer: Specifically formulated for sealing field joints for round spiral lock-seam duct systems.

2.6 SHEET-METAL DUCT SEALER

- A. Hardcast "Duct-Seal 321" or United McGill. Indoor/outdoor, low VOC (<80 grams/liter), water based with fiber reinforcement.

2.7 LAUNDRY CLOTHES DRYER VENT

- A. Aluminum sheet metal, minimum gauge 26 material. Substantially airtight duct except for openings required for operation or maintenance. Duct to have smooth interior surface and not be assembled with sheet-metal screws or other devices that extend into the airstream. Install vent in accordance with manufacturer's instructions and recommendations.

2.8 DAMPERS

- A. Volume Dampers (VD):
 - 1. Construct of galvanized sheets not lighter than 18 gauge, reinforced to prevent vibration, equipped at both ends with brass bearing mounts and of sufficient length to provide a complete shutoff of the duct.
 - 2. Provide each damper with an adjustment and locking quadrant device manufactured by Young Regulator Co., No. 403 operator for accessible locations, or No. 315 for nonaccessible locations. Manufacturer: Ventlock. Provide operating rod and attaching devices as required for No. 315 operator. Provide Young Regulator No. 443 or 443B raised platform for insulated duct.
- B. Register Dampers: Dampers utilized with grilles. Opposed blade dampers utilizing a side operated worm drive which provides external duct operation. Slot the end of the shaft to receive a screwdriver. Factory assembled side operator. Construct of the same material as the grille. Manufacturers: Same as grilles and diffusers. Provide Young Regulator 443 or 443B raised platform for insulated duct.
- C. Backdraft Dampers: Welded 14 gauge aluminum, with blades pivoting off center, double crimped front and rear, polyurethane seals. Link blades to work in unison, pivoting in ball bearings, and provide adjustable counterweights attached to the blades. . Blades start to open at 0.05-inch APD -55 FPM. Blades fully open at 0.06-inch APD -680 FPM. Frames: Channel type with flanges to facilitate mounting. Manufacturers: Louvers & Dampers, Ruskin, Cesco, Greenheck, or Prefco.
- D. Control Dampers: Provide automatic control dampers as indicated. Airfoil, multi-blade type, maximum blade length of 48". Provide parallel blades for positive or modulating mixing service and opposed blades for throttling service. Blades to be interlocking, minimum 16 gauge galvanized steel. Damper blades reinforced, have continuous full

length axle shafts and/or operating jackshafts as required providing coordinated tracking of blades. Dampers over 25 sq.ft. in area to be in two or more sections, with interconnecting blades. Dampers to have a maximum air leakage of 4 cfm psf at 1" w.g. pressure. Provide automatic dampers except those specified with units. Manufacturers: Louvers & Dampers, Ruskin, Cesco, Greenheck, or Prefco.

2.9 AIR FILTERS

- A. Minimum MERV 13 efficiency.

2.10 ADJUSTABLE DEFLECTORS

- A. Manufacturers: Nailor or equal.
- B. Adjustable deflectors and adjustable turning devices for diverting airflow from a main duct into a branch duct. Multi-blade assembly hinged at one end and so constructed that, as it is closed, the air passage between the blades narrows until no air passage remains when the assembly is in the fully closed position.
- C. Construct of the same material as the ductwork in which they are installed.

2.11 DUCT ACCESS DOORS

- A. Gasketed, hinged or removable, rated for operating pressure. Ductmate "Sandwich" for rectangular ductwork or "Metu" for round ductwork.

2.12 CEILING AND INLINE EXHAUST FANS

- A. Direct Drive: Ceiling mounted centrifugal type with direct drive motor, insulated cabinet, vibration isolators, backdraft damper, exhaust grille, speed control, and disconnect switch.
- B. Manufacturers: As specified or equal.

2.13 DUCT-MOUNTED INLINE FANS

- A. General: Galvanized steel fan housing. Square duct-mounting collars. Inlet cone. Belt-driven inline fan. Quiet operation.
- B. Provide access panel for cleaning, inspection, or service without dismantling the fan.

- C. Fan Wheel: Aluminum, backward inclined, centrifugal. Dynamically and statically balanced wheels.
- D. Isolate the motor and drive from the air stream.
- E. Motor: Permanently lubricated, sealed ball bearings.
- F. Wheel Shaft: Ground and polished shafting mounted in sealed, heavy duty pillow block bearings. Designed for air handling applications with a minimum life in excess of 200,000 hours.
- G. Drive: Size drives for a minimum of 150 percent of driven horsepower.
- H. Pulleys: Machined cast iron, keyed and enclosed to the wheel and motor shafts.
- I. Motor Pulleys: Adjustable for final system balancing.
- J. Disconnect Switch: NEMA 1 switches, factory wiring.
- K. Motor cover and belt guard.
- L. Manufacturers: As specified or equal.

2.14 GRILLES, REGISTERS, DIFFUSERS

- A. Subject to compliance with requirements, provide products of one of the following.
- B. Provide 1-, 2-, 3-, or 4-way deflection as indicated.
- C. Register Dampers: Dampers utilized with grilles. Opposed blade dampers utilizing a side operated worm drive that provides external duct operation. Slot the end of the shaft to receive a screwdriver. Factory assembled side operator. Construct of the same material as the grille. Manufacturers: Same as grilles and diffusers.
- D. Coordinate mounting frames with construction types per finish schedule.
- E. Performance: Provide components that have velocity, throw and drop, and noise criteria ratings for each size device as listed in manufacturer's current standard literature, which are plus or minus 10 percent of the components as listed in the Diffuser, Register and Grille Schedule, or as specified herein.
- F. Manufacturers: As specified or equal.

2.15 LOUVERS

- A. General: Frame and sill styles compatible with adjacent substrate, specifically manufactured to fit into construction openings with accurate fit and adequate support for weatherproof installation. Refer to Drawings and Specifications for types of substrate that will contain each type of louver. Construct of aluminum extrusions, ASTM B221, Alloy 6063. Weld units or use stainless steel fasteners. On inside face of exterior louvers, provide anodized aluminum wire insect screen mounted in removable extruded aluminum frames.
- B. Blades set 3" to 5" on center, 30 degree angle with rain hook on blade, minimum blade thickness 0.080", drainable blade style. Minimum 45 percent free area for 48" x 48" unit. Maximum water penetration 0.05 ounce water psf free area at 1000 fpm. Maximum intake pressure drop of 0.10" w.g. at 750 fpm free velocity.
- C. Refer to Drawings for required sizes.
- D. Provide access door in duct to clean bird screen.
- E. Manufacturers: American Warming and Ventilating, Inc., Pottorff, United Metal Products, Vent Products Co., Carnes, Cesco, Industrial Louvers, Inc., Louvers & Dampers, Inc., Ruskin Manufacturing Co., or Greenheck.

2.16 MATERIAL AND FABRICATION

- A. Architect reserves the right to reject submittals which contain equipment from various manufacturers and to require that source of materials be unified to the maximum extent possible.
- B. Belt drive fan units require drive change during air balancing of the system; drives and belts are to be furnished by unit manufacturer or representative.

2.17 OTHER MATERIALS

- A. Other materials not specifically described or listed but required for a complete and proper installation of the work of this Section as selected by the Contractor and subject to review by the Architect.

2.18 REFRIGERANT PIPING

- A. Size refrigerant piping and install per heat pump unit manufacturer's recommendations. Fabricate refrigerant piping of Type "L" hard drawn "ACR" tubing that has been cleaned and capped for refrigeration service. Fittings: wrought copper and installed with silver solder joints. Carefully clean the end of pipe and the inside of fittings before joining. Use no acid in cleaning or as a flux in soldering joints. Bleed nitrogen through piping while soldering.
- B. Furnish, size, install, and insulate refrigerant pipe for the system as shown. Submit shop drawings of piping system showing traps, pipe sizes, and accessories. Pipe sizes to be as recommended by unit manufacturer. Submit line sizing calculations for review by the Engineer.
- C. Provide replaceable core type liquid line filter dryer size for system capacity at 2 psig pressure drop per ARI 710, sight glass-moisture indicator.
- D. Provide U.V. and water-proof protection at all refrigerant pipe at exterior of building, refer to details on the construction documents.

2.19 EQUIPMENT

- A. Split System Heat Pump Air Conditioning Unit:
 - 1. General: Furnish and install a two piece, air-to-air electric heat pump designed to function as year-around air conditioning system. Unit shall be completely assembled and tested to complete with refrigerant charge and ready to operate.

The total unit shall be UL listed and carry an UL label. The unit shall be Fujitsu or equal.

2.20 TEMPERATURE CONTROL

- A. General: The wiring and low voltage temperature control equipment in accordance with the manufacturer's written requirements. Electrical Contractor shall provide all line voltage wiring, and conduit, disconnects, and connect up all motors complete.
- B. Drawings of temperature control system are diagrammatic only, and any apparatus not shown, such as relays, accessories, etc., but required to make the system operative to the complete satisfaction of the Architect shall be furnished and installed without additional cost.
- C. All electric connections to temperature control equipment shown on the Temperature control diagrams or specified, will be furnished and installed by the Mechanical Contractor performing this work, and, where exposed to weather, shall be run in conduit.
- D. All equipment and controls such as starters, switches, relays, etc., shall be clearly identified and labeled as to function and position with permanently engraved nameplates.
- E. Control interlock wiring shall be provided by Mechanical Contractor and installed per manufacturer's recommendations. All controls and control wiring shall be furnished and installed complete by the Mechanical Contractor.
- F. All thermostats shall have separate heating and cooling settings and shall not allow simultaneous heating and cooling.
- G. Equipment furnished by this Contractor that is normally wired before installation shall be furnished completely wired. Temperature control wiring normally performed in the field will be furnished and installed by the Mechanical Contractor.
- H. Prior to installation, the Mechanical Contractor shall submit diagrams, component data and description of sequence of operation to Architect for approval.
- I. Entire system shall be guaranteed for one year with emergency service for an additional year without charge to the Owner from the date of acceptance of the completed building. After completion of the installation, the Mechanical Contractor shall regulate and adjust all thermostats, dampers, motors and other temperature control equipment provided under this Contract.

- J. Entire system shall be as shown on the Drawings.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Examine areas and conditions under which HVAC equipment is to be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

3.2 VERIFICATION OF CONDITIONS

- A. Examine areas and conditions under which equipment and air terminals are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

3.3 DUCTWORK INSTALLATION

- A. Install ductwork in strict conformance with SMACNA standards and comply with CMC requirements.
- B. Erect ductwork true to dimensions indicated, straight and smooth on inside with neatly finished joints lapped in direction of air travel. Properly brace and reinforce ducts with steel angles or members.
- C. Elbows: Standard centerline radius to equal 1-1/2 times width of duct.
- D. Install single thickness turning vanes in square throat rectangular elbows and in tees. Provide 3/4" trailing edge on turning vanes, turned slightly past parallel to the duct where shown on the construction documents.
- E. Duct sizes shown on Drawings are net inside dimensions.
- F. Locate access doors in ductwork as required for maintenance or inspection.
- G. Duct Hangers and Supports:
 - 1. Hang rectangular sheet-metal ducts with a cross sectional area of less than 7 sq.ft. with galvanized strips of No. 16 USS gauge steel 1 inch wide, and larger ducts with steel angles and adjustable hanger rods similar to piping hangers. Support at 8 feet on center, as detailed.
 - 2. Anchor ducts securely to building in such a manner as to prevent transmission of vibration to structure. Do not connect duct hanger straps to roof deck. Do not support ducts from other ducts or piping.

3. For round sheet-metal ducts, provide duct support in accordance with SMACNA Guidelines. Verify type of building construction.
 4. Attach straphangers installed flush with end of sheet-metal duct run to duct with sheet-metal screws.
- H. Joints:
1. Seal joints in sheet-metal ducts in concealed locations (i.e., enclosed ceiling spaces) with Hardcast joint sealant system applied in accordance with manufacturer's recommendations or use Ductmate type joints.
 2. To Connect Sheet-metal Ductwork to Fiberglass Ductboard: Hardcast only.
 3. Standard gray duct tape not allowed.
- I. Do not install duct stiffeners on interior (airside) of unlined ductwork; install on exterior only or on interior of ductwork with duct liner.
- J. Flexible Duct Installation:
1. Provide round neck grilles/diffusers or square-to-round transitions.
 2. Flex duct allowed only at Building #1 for a maximum 5'-0".
 3. Approved for use on supply and return ducts.
 4. Flex duct allowed in concealed spaces only.
 5. Install with bend radius no less than three duct diameters.
 6. Flexible ducts shall be supported at 4'-0" o.c. with 3" wide 28 gauge steel hanger collar attached to the structure with an approved duct hanger. Collars shall have hemmed edges to prevent cutting of flexible duct. Installation shall minimize sharp radius turns or offsets.
- K. Paint inside surface of bare ductwork which is visible through face of grilles with flat black paint for ceilings 12' and lower.
- L. Mounting for Sidewall Grilles and Registers:
1. Mounting heights indicated on Drawings from finish floor to lower edge of grille or register. Exception: If note on Drawings states for example "Down 6 inches," this indicates measurement from ceiling to top edge of grille or register.

2. Install sidewall return air grilles for "sight-tight" visibility at eye level (position blades to obscure visibility from floor level).
- M. Transitions: Where transitions are required in metal or fiberglass ductwork, horizontal and vertical angles forming transition not to exceed 30 degrees. Provide supply and return air transitions at AC unit connections. Plenum connections not allowed at AC unit inlet and outlet.
- N. Seismic Restraint: Brace ductwork and HVAC equipment against lateral movement as detailed in document "Seismic Restraint Manual Guidelines for Mechanical Systems" as published by SMACNA.
- O. Limitations: Do not run ductwork within confines of electrical rooms, elevator shafts or elevator equipment rooms except those ducts specifically serving only such rooms.
- P. Duct Access Doors:
1. Install where shown and required by SMACNA. Provide on the reset side of fire dampers and adjacent to duct mounted automatic dampers. Install per manufacturer's recommendations.
 2. Where access doors are for service of fire or smoke dampers, stencil the words "Fire Damper" or "Smoke Damper" in 1/2-inch-high capital letters on the outside of the door.
- Q. Volume Dampers: Provide in branch ducts serving air inlets and outlets where shown on the construction documents.
- R. Air Outlets and Inlets:
1. Install grilles, registers, and diffusers per manufacturer's instructions. Locate and size openings through finished surfaces to provide complete coverage of rough openings by integral device flanges or auxiliary frames.
 2. Paint exterior of devices per color selected by Architect.
 3. Coordinate duct connections with device final dimensions. Provide square to round adapters where required for connection to round ducts.
 4. Adjust the throws of air outlets to eliminate drafts.

3.4 EQUIPMENT INSTALLATION

- A. Heating and Cooling Units:

1. General: Install units in accordance with manufacturer's installation instructions, plumb and level, and firmly anchored in locations indicated. Maintain manufacturer's recommended clearances.
2. Inspection: Examine areas and conditions under which units are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected.
3. Secure fans to curb with lag bolts on each side. Seal with mastic. Mount level.

B. Equipment:

1. General: Install in accordance with manufacturer's installation instructions, plumb and level, firmly anchored to curb. Maintain manufacturer's recommended clearances.
2. Controls: Furnish field installed automatic temperature control requirements as indicated.
3. Start up equipment in accordance with manufacturer's start-up instructions. Test controls and demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment.
 - a. Do not place equipment in sustained operation prior to initial balancing of mechanical systems.
 - b. Furnish sufficient refrigerant and dry nitrogen for pressure testing per manufacturer's written instructions.

C. Air-Cooled Heat Pump Units: Connect refrigerant piping to unit, run piping so as not to interfere with access to unit. Install furnished field mounted accessories. Verify manufacturer's requirements and provide accumulator when required due to length of refrigerant piping.

D. Refrigerant System:

1. Piping: Install refrigerant piping per unit manufacturer's latest published recommendations straight and free from kinks and restrictions, properly supported by Trisolator or Cush-A-Strip S-715 to minimize vibration. Furnish and install straps or hangers at 5' spacing for 1/2" lines, 6' spacing for 1" lines. Pass a slow stream of dry nitrogen through the tubing at times while soldering to eliminate the formation of copper oxide inside the tubing.
2. Slope lines to facilitate oil return to compressor. Provide suction line traps per manufacturer's recommendations.
3. Test piping to 150 psi.
4. After dehydration, introduce the manufacturer's recommended type and quantity of refrigerant into system through a filter/dryer.

3.5 TRAINING OF OWNER'S PERSONNEL

- A. Instruct Owner's personnel in operation and maintenance of equipment provided under this Section. Schedule training with Owner; provide at least a 7-day notice to Owner and Architect of training date.

3.6 CLEANING

- A. Clean exposed factory finished surfaces.

3.7 FILTERS

- A. Install complete sets of filters before operation of the supply fans. Do not operate fans without filters installed. .
- B. Clean filters to be installed prior to system balancing.

3.8 FIRESTOPPING PENETRATIONS IN FIRE-RATED WALL/FLOOR ASSEMBLIES

- A. Provide proper sizing when providing sleeves or core-drilled holes to accommodate the penetration. Firestop voids between sleeve or core-drilled hole and pipe passing through to meet the requirements of ASTM E814. Refer to details on the construction documents.
- B. Manufacturers: Hilti or Proset.

3.9 FACTORY TESTING

- A. Test equipment at the factory prior to shipping.

3.10 FIELD QUALITY CONTROL

- A. Closing in uninspected work: Do not allow or cause any of this work to be covered up before it has been duly inspected, tested and approved by the Architect or any other authorized inspectors having legal jurisdiction over this work. Should the Contractor fail to observe the above, the work shall be uncovered, and after inspection, testing, and approval, re-covered at no additional expense.

3.11 TEST AND ADJUSTMENT

- A. Upon completion of the work, all equipment and systems shall be operated and tested for a period of at least three (3) consecutive days to demonstrate their satisfactory overall operation. On the last day of this period, the Contractor shall arrange for an acceptance test and final inspection to be conducted by the Engineer in the presence of the Contractor or his representative. The Engineer shall be notified of this meeting at least one week in advance of the time proposed by the Contractor and a mutually agreeable time arranged. The Contractor shall make all necessary adjustments and corrections to the systems prior to acceptance test so that the systems are operating smoothly and properly and are absolutely ready for check and acceptance at this time.
- B. Any equipment, system, or work found deficient during the test shall be replaced or revised as required to the entire satisfaction of the Engineer.
- C. During this time, a representative of the Owner shall be instructed in the proper care and operation of the equipment and controls. A set of typewritten instructions giving pertinent operating data shall be framed under glass and mounted in a location as directed by the Engineer. This includes wiring and schematic diagrams of all the controls, thermostats, etc.

END OF SECTION

CORNERSTONE

PROJECT NO. 1918

BID SET

NOVEMBER 18, 2021