TERRACES AT HIGH MOUNTAIN

4130 HIGH MOUNTAIN ROAD NE HUNTSVILLE, AL 35811

PROJECT MANUAL

PERMIT : 11 JUNE 2021



470 TREDEGAR ST RICHMOND VA 23219

TABLE OF CONTENTS

DIVISION 00 - PROCUREMENT AND CONTRACTING REQUIREMENTS

NOT APPLICABLE

DIVISION 01 - GENERAL REQUIREMENTS

SECTION 012100 - ALLOWANCES SECTION 012200 - UNIT PRICES SECTION 012300 - ALTERNATES SECTION 012500 - SUBSTITUTION PROCEDURES SECTION 012600 - CONTRACT MODIFICATION PROCEDURES SECTION 012900 - PAYMENT PROCEDURES SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION SECTION 013300 - SUBMITTAL PROCEDURES SECTION 014000 - QUALITY REQUIREMENTS SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS SECTION 016000 - PRODUCT REQUIREMENTS SECTION 017300 - EXECUTION SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL SECTION 017700 - CLOSEOUT PROCEDURES SECTION 017823 - OPERATION AND MAINTENANCE DATA SECTION 017839 - PROJECT RECORD DOCUMENTS

DIVISION 02 - EXISTING CONDITIONS

NOT APPLICABLE

DIVISION 03 - CONCRETE

SECTION 033000 - CAST-IN-PLACE CONCRETE SECTION 033053 - INTEGRALLY COLORED ARCHITECTURAL CAST-IN-PLACE CONCRETE SECTION 033543 - POLISHED CONCRETE FINISHING SECTION 035413 - GYPSUM CEMENT UNDERLAYMENT SECTION 036200 - NONSHRINK GROUT

DIVISION 04 - MASONRY

SECTION 042000 - UNIT MASONRY SECTION 047300 - SIMULATED MASONRY

DIVISION 05 - METALS

SECTION 051200 - STRUCTURAL STEEL SECTION 051210 - STRUCTURAL STEEL (MINOR) SECTION 055113 - METAL PAN STAIRS SECTION 057300 - DECORATIVE METAL RAILINGS DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES

SECTION 061000 - ROUGH CARPENTRY SECTION 061300 - HEAVY TIMBER CONSTRUCTION SECTION 061600 - SHEATHING SECTION 061753 - PREFABRICATED PLATE CONNECTED WOOD TRUSSES SECTION 062013 - EXTERIOR FINISH CARPENTRY SECTION 064023 - INTERIOR ARCHITECTURAL WOODWORK SECTION 064113 - WOOD-VENEER-FACED ARCHITECTURAL CABINETS SECTION 064600 - WOOD TRIM

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

SECTION 071326 - SELF-ADHERING SHEET WATERPROOFING SYSTEM SECTION 071900 - WATER REPELLENTS SECTION 072100 - THERMAL INSULATION SECTION 072500 - WEATHER RESISTIVE BARRIER SECTION 072600 - VAPOR RETARDERS SECTION 073113 - ASPHALT SHINGLES SECTION 074113.16 - STANDING-SEAM METAL ROOF PANELS SECTION 074646 - FIBER CEMENT SIDING PANELS SECTION 075423 - THERMOPLASTIC POLYOLEFIN (TPO) ROOFING SECTION 076200 - SHEET METAL FLASHING AND TRIM SECTION 077100 - ROOF SPECIALTIES SECTION 077200 - ROOF ACCESSORIES SECTION 077253 - SNOW GUARDS SECTION 078413 - PENETRATION FIRESTOPPING SECTION 078443 - JOINT FIRESTOPPING SECTION 079200 - JOINT SEALANTS

DIVISION 08 - OPENINGS

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES SECTION 081416 - FLUSH WOOD DOORS SECTION 081433.13 - WOOD TERRACE DOORS SECTION 081613 - FIBERGLASS ENTRY DOORS SECTION 083100 - ACCESS DOORS, PANELS, AND HATCHES SECTION 083613 - RESIDENTIAL SECTIONAL DOORS SECTION 084213 - ALUMINUM-FRAMED ENTRANCES SECTION 084313 - ALUMINUM-FRAMED STOREFRONTS SECTION 085313 - VINYL WINDOWS SECTION 088000 - GLAZING SECTION 088300 - MIRRORS

DIVISION 09 - FINISHES

SECTION 092900 - GYPSUM BOARD SECTION 093013 - CERAMIC TILING SECTION 095123 - ACOUSTICAL TILE CEILINGS SECTION 096516 - RESILIENT SHEET FLOORING SECTION 096519 - RESILIENT TILE FLOORING SECTION 099113 - EXTERIOR PAINTING SECTION 099123 - INTERIOR PAINTING SECTION 099300 - STAINING AND TRANSPARENT FINISHING

DIVISION 10 - SPECIALTIES

SECTION 101423.13 - ROOM-IDENTIFICATION SIGNAGE SECTION 102800 - TOILET, BATH, AND LAUNDRY ACCESSORIES SECTION 105500.13 - USPS-DELIVERY POSTAL SPECIALTIES

DIVISION 11 - EQUIPMENT

SECTION 113013 - RESIDENTIAL APPLIANCES

DIVISION 12 - FURNISHINGS

SECTION 122113 - HORIZONTAL LOUVER BLINDS SECTION 122413 - ROLLER WINDOW SHADES SECTION 123530 - RESIDENTIAL CASEWORK SECTION 123640 - STONE COUNTERTOPS SECTION 129313 - BICYCLE RACKS AND LOCKERS SECTION 129333 - MANUFACTURED PLANTERS

DIVISION 13 - SPECIAL CONSTRUCTION

NOT APPLICABLE

DIVISION 14 - CONVEYING EQUIPMENT

SECTION 142100 - ELECTRIC TRACTION PASSENGER ELEVATORS

DIVISION 21 - FIRE SUPPRESSION

NOT APPLICABLE

DIVISION 22 - PLUMBING

NOT APPLICABLE

DIVISION 23 - HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)

NOT APPLICABLE

DIVISION 25 - INTEGRATED AUTOMATION

NOT APPLICABLE

DIVISION 26 - ELECTRICAL

NOT APPLICABLE

DIVISION 27 - COMMUNICATIONS

NOT APPLICABLE

DIVISION 28 - ELECTRONIC SAFETY AND SECURITY

NOT APPLICABLE

DIVISION 31 - EARTHWORK

NOT APPLICABLE

DIVISION 32 - EXTERIOR IMPROVEMENTS

SECTION 321216 - ASPHALT PAVING SECTION 321243 - POROUS FLEXIBLE PAVING SECTION 321316 - DECORATIVE CONCRETE PAVING SECTION 321400 - UNIT PAVING SECTION 321543 - AGGREGATE PAVEMENT SECTION 321713 - PARKING BUMPERS SECTION 321816.13 - PLAYGROUND PROTECTIVE SURFACING SECTION 321816.14 - POURED-IN-PLACE GRANULAR RUBBER SURFACING SECTION 323119 - EXODUS® - EGRESS GATE SYSTEM - PREHUNG GATE SECTION 323120 - MONTAGE II® - HEAVY INDUSTRIAL STEEL ORNAMENTAL FENCE SYSTEM SECTION 323300 - SITE FURNISHINGS SECTION 328400 - PLANTING IRRIGATION SECTION 329200 - LAWNS AND GRASSES SECTION 329300 - PLANTS

DIVISION 33 - UTILITIES

SECTION 334600 - SUBDRAINAGE

DIVISION 34 - TRANSPORTATION

NOT APPLICABLE

DIVISION 35 - WATERWAY AND MARINE CONSTRUCTION

NOT APPLICABLE

DIVISION 40 - PROCESS INTEGRATION

NOT APPLICABLE

DIVISION 41 - MATERIAL PROCESSING AND HANDLING EQUIPMENT

NOT APPLICABLE

DIVISION 42 - PROCESS HEATING, COOLING, AND DRYING EQUIPMENT

NOT APPLICABLE

DIVISION 43 - PROCESS GAS AND LIQUID HANDLING, PURIFICATION AND STORAGE EQUIPMENT

NOT APPLICABLE

DIVISION 44 - POLLUTION CONTROL EQUIPMENT

NOT APPLICABLE

DIVISION 45 - INDUSTRY-SPECIFIC MANUFACTURING EQUIPMENT

NOT APPLICABLE

DIVISION 46 - WATER AND WASTEWATER EQUIPMENT

NOT APPLICABLE

DIVISION 48 - ELECTRICAL POWER GENERATION

NOT APPLICABLE

SECTION 012100 - ALLOWANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements governing allowances.
- B. Types of allowances include the following:
 - 1. Lump-sum allowances.
 - 2. Unit-cost allowances.
 - 3. Quantity allowances.
 - 4. Contingency allowances.
 - 5. Testing and inspecting allowances.
- C. Related Requirements:
 - 1. Section 012200 "Unit Prices" for procedures for using unit prices, including adjustment of quantity allowances when applicable.
 - 2. Section 014000 "Quality Requirements" for procedures governing the use of allowances for field testing by an independent testing agency.

1.3 DEFINITIONS

A. Allowance is a quantity of work or dollar amount established in lieu of additional requirements, used to defer selection of actual materials and equipment to a later date when direction will be provided to Contractor. If necessary, additional requirements will be issued by Change Order.

1.4 SELECTION AND PURCHASE

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

ALLOWANCES

1.5 ACTION SUBMITTALS

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

1.6 INFORMATIONAL SUBMITTALS

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

1.7 LUMP-SUM ALLOWANCES

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

1.8 UNIT-COST ALLOWANCES

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

ALLOWANCES

1. If requested by Architect, retain and prepare unused material for storage by Owner. Deliver unused material to Owner's storage space as directed.

1.9 QUANTITY ALLOWANCES

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

1.10 CONTINGENCY ALLOWANCES

- A. Use the contingency allowance only as directed by Architect for Owner's purposes and only by Change Orders that indicate amounts to be charged to the allowance.
- B. Contractor's overhead, profit, and related costs for products and equipment ordered by Owner under the contingency allowance are included in the allowance and are not part of the Contract Sum. These costs include delivery, installation, taxes, insurance, equipment rental, and similar costs.
- C. Change Orders authorizing use of funds from the contingency allowance will include Contractor's related costs and reasonable overhead and profit.
- D. At Project closeout, credit unused amounts remaining in the contingency allowance to Owner by Change Order.

1.11 TESTING AND INSPECTING ALLOWANCES

- A. Testing and inspecting allowances include the cost of engaging testing agencies, actual tests and inspections, and reporting results.
- B. The allowance does not include incidental labor required to assist the testing agency or costs for retesting if previous tests and inspections result in failure. The cost for incidental labor to assist the testing agency shall be included in the Contract Sum.
- C. Costs of testing and inspection services not required by the Contract Documents are not included in the allowance.

D. At Project closeout, credit unused amounts remaining in the testing and inspecting allowance to Owner by Change Order.

1.12 ADJUSTMENT OF ALLOWANCES

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

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

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

END OF SECTION 012100

SECTION 012200 - UNIT PRICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for unit prices.
- B. Related Requirements:
 - 1. Section 012100 "Allowances" for procedures for using unit prices to adjust quantity allowances.
 - 2. Section 012600 "Contract Modification Procedures" for procedures for submitting and handling Change Orders.
 - 3. Section 014000 "Quality Requirements" for field testing by an independent testing agency.

1.3 DEFINITIONS

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

1.4 PROCEDURES

- A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.
- B. Measurement and Payment: See individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.
- C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.
- D. List of Unit Prices: A schedule of unit prices is included in Part 3. Specification Sections referenced in the schedule contain requirements for materials described under each unit price.

UNIT PRICES

PART 2 - PRODUCTS (Not Used)

END OF SECTION 012200

SECTION 012300 - ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for alternates.

1.3 DEFINITIONS

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

1.4 PROCEDURES

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

PART 2 - PRODUCTS (Not Used)

END OF SECTION 012300

SECTION 012500 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for substitutions.
- B. Related Requirements:
 - 1. Section 012100 "Allowances" for products selected under an allowance.
 - 2. Section 012300 "Alternates" for products selected under an alternate.
 - 3. Section 016000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.3 DEFINITIONS

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

1.4 ACTION SUBMITTALS

- A. Substitution Requests: Submit one digital and one physical copy if applicable of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 - a. Statement indicating why specified product or fabrication or installation method cannot be provided, if applicable.

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

1.5 QUALITY ASSURANCE

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

1.6 PROCEDURES

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

1.7 SUBSTITUTIONS

- A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.
 - 1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
 - a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - b. Substitution request is fully documented and properly submitted.
 - c. Requested substitution will not adversely affect Contractor's construction schedule.
 - d. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - e. Requested substitution is compatible with other portions of the Work.
 - f. Requested substitution has been coordinated with other portions of the Work.
 - g. Requested substitution provides specified warranty.
 - h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
- B. Substitutions for Convenience: Architect will consider requests for substitution if received within 60 days after commencement of the Work . Requests received after that time may be considered or rejected at discretion of Architect.
 - 1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
 - a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
 - b. Requested substitution does not require extensive revisions to the Contract Documents.

- c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
- d. Substitution request is fully documented and properly submitted.
- e. Requested substitution will not adversely affect Contractor's construction schedule.
- f. Requested substitution has received necessary approvals of authorities having jurisdiction.
- g. Requested substitution is compatible with other portions of the Work.
- h. Requested substitution has been coordinated with other portions of the Work.
- i. Requested substitution provides specified warranty.
- j. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500

SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for handling and processing Contract modifications.
- B. Related Requirements:
 - 1. Section 012500 "Substitution Procedures" for administrative procedures for handling requests for substitutions made after the Contract award.
 - 2. Section 013100 "Project Management and Coordination" for requirements for forms for contract modifications provided as part of web-based Project management software.

1.3 MINOR CHANGES IN THE WORK

A. Architect will issue[through Construction Manager] supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on [AIA Document G710] [form included in Project Manual] [web-based Project management software].

1.4 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: [Architect] [Construction Manager] will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
 - 1. Work Change Proposal Requests issued by [Architect] [Construction Manager] are not instructions either to stop work in progress or to execute the proposed change.
 - 2. Within [time specified in Proposal Request] [or] [20 days, when not otherwise specified,] <Insert number of days> after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.

- a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
- b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
- c. Include costs of labor and supervision directly attributable to the change.
- d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
- e. Quotation Form: Use [forms provided by Owner. Sample copies are included in Project Manual] [forms acceptable to Architect] [form provided as part of web-based Project management software].
- B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to [Architect] [Construction Manager].
 - Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
 - 2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - 3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - 4. Include costs of labor and supervision directly attributable to the change.
 - 5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
 - 6. Comply with requirements in Section 012500 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
 - 7. Proposal Request Form: Use [form provided by Owner. Sample copy is included in Project Manual] [form acceptable to Architect] [form provided as part of web-based Project management software].

1.5 ADMINISTRATIVE CHANGE ORDERS

- A. Allowance Adjustment: See Section 012100 "Allowances" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect actual costs of allowances.
- B. Unit-Price Adjustment: See Section 012200 "Unit Prices" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect measured scope of unit-price work.

1.6 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Work Change Proposal Request, [Architect] [Construction Manager] will issue a Change Order for signatures of Owner and Contractor on [AIA Document G701] [AIA Document G701CMa] [form included in Project Manual] [form provided as part of web-based Project management software].

1.7 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: [Architect] [Construction Manager] may issue a Construction Change Directive on [AIA Document G714] [AIA Document G714CMa] [form included in Project Manual] [form provided as part of web-based Project management software]. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
 - 1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.
- B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
 - 1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

1.8 WORK CHANGE DIRECTIVE

- A. Work Change Directive: [Architect] [Construction Manager] may issue a Work Change Directive on [EJCDC Document C-940] [form included in Project Manual] [form provided as part of web-based Project management software]. Work Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
 - 1. Work Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.
- B. Documentation: Maintain detailed records on a time and material basis of work required by the Work Change Directive.
 - 1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012600

SECTION 012900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.

1.3 DEFINITIONS

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

1.4 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule. Cost-loaded Critical Path Method Schedule may serve to satisfy requirements for the schedule of values.
 - 1. Coordinate line items in the schedule of values with items required to be indicated as separate activities in Contractor's construction schedule.
 - 2. Submit the schedule of values to Architect through Construction Manager at earliest possible date, but no later than seven days before the date scheduled for submittal of initial Applications for Payment.
 - 3. Subschedules for Phased Work: Where the Work is separated into phases requiring separately phased payments, provide subschedules showing values coordinated with each phase of payment.
 - 4. Subschedules for Separate Elements of Work: Where the Contractor's construction schedule defines separate elements of the Work, provide subschedules showing values coordinated with each element.

- 5. Subschedules for Separate Design Contracts: Where the Owner has retained design professionals under separate contracts who will each provide certification of payment requests, provide subschedules showing values coordinated with the scope of each design services contract, as described in Section 011000 "Summary."
- B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.
 - 1. Identification: Include the following Project identification on the schedule of values:
 - a. Project name and location.
 - b. Owner's name.
 - c. Owner's Project number.
 - d. Name of Architect.
 - e. Architect's Project number.
 - f. Contractor's name and address.
 - g. Date of submittal.
 - 2. Arrange schedule of values consistent with format of AIA Document G703.
 - 3. Arrange the schedule of values in tabular form, with separate columns to indicate the following for each item listed:
 - a. Related Specification Section or division.
 - b. Description of the Work.
 - c. Name of subcontractor.
 - d. Name of manufacturer or fabricator.
 - e. Name of supplier.
 - f. Change Orders (numbers) that affect value.
 - g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent. Round dollar amounts to whole dollars, with total equal to Contract Sum.
 - 1) Labor.
 - 2) Materials.
 - 3) Equipment.
 - 4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum.
 - 5. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
 - a. Differentiate between items stored on-site and items stored off-site.

- 6. Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
- 7. Purchase Contracts: Provide a separate line item in the schedule of values for each Purchase contract. Show line-item value of Purchase contract. Indicate Owner payments or deposits, if any, and balance to be paid by Contractor.
- 8. Overhead Costs, Proportional Distribution: Include total cost and proportionate share of general overhead and profit for each line item.
- 9. Overhead Costs, Separate Line Items: Show cost of temporary facilities and other major cost items that are not direct cost of actual work-in-place as separate line items.
- 10. Temporary Facilities: Show cost of temporary facilities and other major cost items that are not direct cost of actual work-in-place as separate line items.
- 11. Closeout Costs. Include separate line items under Contractor and principal subcontracts for Project closeout requirements in an amount totaling five percent of the Contract Sum and subcontract amount.
- 12. Schedule of Values Revisions: Revise the schedule of values when Change Orders or Construction Change Directives result in a change in the Contract Sum. Include at least one separate line item for each Change Order and Construction Change Directive.

1.5 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments, as certified by Architect and Construction Manager and paid for by Owner.
- B. Payment Application Times: Submit Application for Payment to Architect by the 7th of the month. The period covered by each Application for Payment is one month, ending on the last day of the month.
- C. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.
 - 1. Other Application for Payment forms proposed by the Contractor may be acceptable to Architect and Owner. Submit forms for approval with initial submittal of schedule of values.
- D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
 - 1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.

- 2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
- 3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
- 4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.
- E. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.
 - 1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment for stored materials.
 - 2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
 - 3. Provide summary documentation for stored materials indicating the following:
 - a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
 - b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
 - c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.
- F. Transmittal: Submit [three] <Insert number> signed and notarized original copies of each Application for Payment to [Architect] [Construction Manager] by a method ensuring receipt[within 24 hours]. One copy shall include waivers of lien and similar attachments if required.
 - 1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- G. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
 - 1. List of subcontractors.
 - 2. Schedule of values.
 - 3. Contractor's construction schedule (preliminary if not final).
 - 4. Combined Contractor's construction schedule (preliminary if not final) incorporating Work of multiple contracts, with indication of acceptance of schedule by each Contractor.
 - 5. Products list (preliminary if not final).
 - 6. Sustainable design action plans, including preliminary project materials cost data.
 - 7. Schedule of unit prices.
 - 8. Submittal schedule (preliminary if not final).
 - 9. List of Contractor's staff assignments.
 - 10. List of Contractor's principal consultants.
 - 11. Copies of building permits.

- 12. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
- 13. Initial progress report.
- 14. Report of preconstruction conference.
- 15. Certificates of insurance and insurance policies.
- 16. Performance and payment bonds.
- 17. Data needed to acquire Owner's insurance.
- H. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
 - 1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
 - a. Complete administrative actions, submittals, and Work preceding this application, as described in Section 017700 "Closeout Procedures."
 - 2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- I. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
 - 1. Evidence of completion of Project closeout requirements.
 - 2. Certification of completion of final punch list items.
 - 3. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 - 4. Updated final statement, accounting for final changes to the Contract Sum.
 - 5. AIA Document G706.
 - 6. AIA Document G706A.
 - 7. AIA Document G707.
 - 8. Evidence that claims have been settled.
 - 9. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
 - 10. Final liquidated damages settlement statement.
 - 11. Proof that taxes, fees, and similar obligations are paid.
 - 12. Waivers and releases.
- PART 2 PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - 1. General coordination procedures.
 - 2. Coordination drawings.
 - 3. RFIs.
 - 4. Digital project management procedures.
 - 5. Project meetings.
- B. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.
- C. Related Requirements:
 - 1. Section 013200 "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
 - 2. Section 017300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
 - 3. Section 017700 "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS

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

1.4 INFORMATIONAL SUBMITTALS

A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:

- 1. Name, address, telephone number, and email address of entity performing subcontract or supplying products.
- 2. Number and title of related Specification Section(s) covered by subcontract.
- 3. Drawing number and detail references, as appropriate, covered by subcontract.
- B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.
 - 1. Post copies of list in project meeting room, in temporary field office or in web-based Project software directory, and in prominent location in each built facility. Keep list current at all times.

1.5 GENERAL COORDINATION PROCEDURES

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

PROJECT MANAGEMENT AND COORDINATION

1.6 REQUEST FOR INFORMATION (RFI)

- A. General: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
 - 1. Architect will return without response those RFIs submitted to Architect by other entities controlled by Contractor.
 - 2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
 - 1. Project name.
 - 2. Project number.
 - 3. Date.
 - 4. Due Date.
 - 5. Name of Contractor.
 - 6. Name of Architect.
 - 7. RFI number, numbered sequentially.
 - 8. RFI subject.
 - 9. Specification Section number and title and related paragraphs, as appropriate.
 - 10. Drawing number and detail references, as appropriate.
 - 11. Field dimensions and conditions, as appropriate.
 - 12. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 - 13. Contractor's signature.
 - 14. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
 - a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
- C. RFI Forms: Software-generated form with substantially the same content as indicated above, acceptable to Architect.
 - 1. Attachments shall be electronic files in PDF format.
- D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.
 - 1. The following Contractor-generated RFIs will be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for approval of Contractor's means and methods.

- d. Requests for coordination information already indicated in the Contract Documents.
- e. Requests for adjustments in the Contract Time or the Contract Sum.
- f. Requests for interpretation of Architect's actions on submittals.
- g. Incomplete RFIs or inaccurately prepared RFIs.
- 2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt by Architect of additional information.
- 3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 012600 "Contract Modification Procedures."
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the RFI response.
- E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log bi-weekly. Use software log that is part of web-based Project software. Include the following:
 - 1. Project name.
 - 2. Name and address of Contractor.
 - 3. Name and address of Architect.
 - 4. RFI number including RFIs that were returned without action or withdrawn.
 - 5. RFI description.
 - 6. Date the RFI was submitted.
 - 7. Date Architect's response was received.
 - 8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
- F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.

1.7 DIGITAL PROJECT MANAGEMENT PROCEDURES

- A. Use of Architect's Digital Data Files: Digital data files of Architect's CAD drawings will be provided by Architect for Contractor's use during construction.
 - 1. Digital data files may be used by Contractor in preparing coordination drawings, Shop Drawings, and Project record Drawings.
 - 2. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Contract Drawings.
 - 3. Contractor shall execute a data licensing agreement in the form of Agreement form acceptable to Owner and Architect.
 - a. Subcontractors, and other parties granted access by Contractor to Architect's digital data files shall execute a data licensing agreement in the form of Agreement acceptable to Owner and Architect.

- B. PDF Document Preparation: Where PDFs are required to be submitted to Architect, prepare as follows:
 - 1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
 - 2. Name file with submittal number or other unique identifier, including revision identifier.
 - 3. Certifications: Where digitally submitted certificates and certifications are required, provide a digital signature with digital certificate on where indicated.

1.8 PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.
 - 1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times a minimum of 10 working days prior to meeting.
 - 2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
 - 3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.
- B. Preconstruction Conference: Schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.
 - 1. Attendees: Authorized representatives of Owner Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 - 2. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Responsibilities and personnel assignments.
 - b. Tentative construction schedule.
 - c. Phasing.
 - d. Critical work sequencing and long lead items.
 - e. Designation of key personnel and their duties.
 - f. Lines of communications.
 - g. Use of web-based Project software.
 - h. Procedures for processing field decisions and Change Orders.
 - i. Procedures for RFIs.
 - j. Procedures for testing and inspecting.
 - k. Procedures for processing Applications for Payment.
 - I. Distribution of the Contract Documents.

- m. Submittal procedures.
- n. Sustainable design requirements.
- o. Preparation of Record Documents.
- p. Use of the premises.
- q. Work restrictions.
- r. Working hours.
- s. Owner's occupancy requirements.
- t. Responsibility for temporary facilities and controls.
- u. Procedures for moisture and mold control.
- v. Procedures for disruptions and shutdowns.
- w. Construction waste management and recycling.
- x. Parking availability.
- y. Office, work, and storage areas.
- z. Equipment deliveries and priorities.
- aa. First aid.
- bb. Security.
- cc. Progress cleaning.
- 3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.
- C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity when required by other sections and when required for coordination with other construction.
 - 1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
 - 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
 - a. Contract Documents.
 - b. Options.
 - c. Related RFIs.
 - d. Related Change Orders.
 - e. Purchases.
 - f. Deliveries.
 - g. Submittals.
 - h. Review of mockups.
 - i. Possible conflicts.
 - j. Compatibility requirements.
 - k. Time schedules.
 - I. Weather limitations.
 - m. Manufacturer's written instructions.
 - n. Warranty requirements.
 - o. Compatibility of materials.
 - p. Acceptability of substrates.
 - q. Temporary facilities and controls.
 - r. Space and access limitations.
 - s. Regulations of authorities having jurisdiction.
 - t. Testing and inspecting requirements.

- u. Installation procedures.
- v. Coordination with other work.
- w. Required performance results.
- x. Protection of adjacent work.
- y. Protection of construction and personnel.
- 3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
- 4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
- 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Project Closeout Conference: Schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, but no later than 90 days prior to the scheduled date of Substantial Completion.
 - 1. Conduct the conference to review requirements and responsibilities related to Project closeout.
 - 2. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 - 3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
 - a. Preparation of Record Documents.
 - b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
 - c. Procedures for completing and archiving web-based Project software site data files.
 - d. Submittal of written warranties.
 - e. Requirements for completing sustainable design documentation.
 - f. Requirements for preparing operations and maintenance data.
 - g. Requirements for delivery of material samples, attic stock, and spare parts.
 - h. Requirements for demonstration and training.
 - i. Preparation of Contractor's punch list.
 - j. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
 - k. Submittal procedures.
 - I. Coordination of separate contracts.
 - m. Owner's partial occupancy requirements.
 - n. Installation of Owner's furniture, fixtures, and equipment.
 - o. Responsibility for removing temporary facilities and controls.
 - 4. Minutes: Entity conducting meeting will record and distribute meeting minutes.
- E. Progress Meetings: Conduct progress meetings at biweekly intervals.

- 1. Coordinate dates of meetings with preparation of payment requests.
- 2. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
- 3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - 1) Review schedule for next period.
 - b. Review present and future needs of each entity present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Status of submittals.
 - 4) Status of sustainable design documentation.
 - 5) Deliveries.
 - 6) Off-site fabrication.
 - 7) Access.
 - 8) Site use.
 - 9) Temporary facilities and controls.
 - 10) Progress cleaning.
 - 11) Quality and work standards.
 - 12) Status of correction of deficient items.
 - 13) Field observations.
 - 14) Status of RFIs.
 - 15) Status of Proposal Requests.
 - 16) Pending changes.
 - 17) Status of Change Orders.
 - 18) Pending claims and disputes.
 - 19) Documentation of information for payment requests.
- 4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.
 - a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.
5. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

- 1. Submittal schedule requirements.
- 2. Administrative and procedural requirements for submittals.
- B. Related Requirements:
 - 1. Section 013100 "Project Management and Coordination" for submitting coordination drawings and subcontract list and for requirements for web-based Project software.
 - 2. Section 014000 "Quality Requirements" for submitting test and inspection reports, and schedule of tests and inspections.
 - 3. Section 017700 "Closeout Procedures" for submitting closeout submittals and maintenance material submittals.
 - 4. Section 017823 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
 - 5. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.

1.3 DEFINITIONS

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

1.4 SUBMITTAL SCHEDULE

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

1.5 SUBMITTAL FORMATS

- A. Submittal Information: Include the following information in each submittal:
 - 1. Project name.
 - 2. Date.
 - 3. Name of Architect.
 - 4. Name of Construction Manager.
 - 5. Name of Contractor.
 - 6. Name of firm or entity that prepared submittal.
 - 7. Names of subcontractor, manufacturer, and supplier.
 - 8. Unique submittal number, including revision identifier. Include Specification Section number with sequential alphanumeric identifier; and alphanumeric suffix for resubmittals.
 - 9. Category and type of submittal.
 - 10. Submittal purpose and description.

- 11. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.
- 12. Drawing number and detail references, as appropriate.
- 13. Indication of full or partial submittal.
- 14. Location(s) where product is to be installed, as appropriate.
- 15. Other necessary identification.
- 16. Remarks.
- 17. Signature of transmitter.
- B. Options: Identify options requiring selection by Architect.
- C. Deviations and Additional Information: On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and limitations; include relevant additional information and revisions, other than those requested by Architect on previous submittals. Indicate by highlighting on each submittal or noting on attached separate sheet.
- D. PDF Submittals: Prepare submittals as PDF package, incorporating complete information into each PDF file. Name PDF file with submittal number.
- E. Optional: Submittals for Web-Based Project Software: Prepare submittals as PDF files, or other format indicated by Project software website.

1.6 SUBMITTAL PROCEDURES

- A. Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
 - 1. Email: Prepare submittals as PDF package, and transmit to Architect by sending via email. Include PDF transmittal form. Include information in email subject line as requested by Architect.
 - a. Architect will return annotated file. Annotate and retain one copy of file as a digital Project Record Document file.
 - 2. Optional:Web-Based Project Software: Prepare submittals in PDF form, and upload to web-based Project software website. Enter required data in web-based software site to fully identify submittal.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
 - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 - 2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
 - 3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
 - 4. Coordinate transmittal of submittals for related parts of the Work specified in different Sections 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.
- C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
 - 1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
 - 2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
 - 3. Resubmittal Review: Allow 15 days for review of each resubmittal.
 - 4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.
 - 5. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Architect's consultants, allow 15 days for review of each submittal. Submittal will be returned to Architect before being returned to Contractor.
- D. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
 - 1. Note date and content of previous submittal.
 - 2. Note date and content of revision in label or title block and clearly indicate extent of revision.
 - 3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.
- E. 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.
- F. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

1.7 SUBMITTAL REQUIREMENTS

- A. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
 - 1. If information must be specially prepared for submittal because standard published data are unsuitable for use, submit as Shop Drawings, not as Product Data.

- 2. Mark each copy of each submittal to show which products and options are applicable.
- 3. Include the following information, as applicable:
 - a. Manufacturer's catalog cuts.
 - b. Manufacturer's product specifications.
 - c. Standard color charts.
 - d. Statement of compliance with specified referenced standards.
 - e. Testing by recognized testing agency.
 - f. Application of testing agency labels and seals.
 - g. Notation of coordination requirements.
 - h. Availability and delivery time information.
- 4. For equipment, include the following in addition to the above, as applicable:
 - a. Wiring diagrams that show factory-installed wiring.
 - b. Printed performance curves.
 - c. Operational range diagrams.
 - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
- 5. Submit Product Data before Shop Drawings, and before or concurrent with Samples.
- B. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data unless submittal based on Architect's digital data drawing files is otherwise permitted.
 - 1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Identification of products.
 - b. Schedules.
 - c. Compliance with specified standards.
 - d. Notation of coordination requirements.
 - e. Notation of dimensions established by field measurement.
 - f. Relationship and attachment to adjoining construction clearly indicated.
 - g. Seal and signature of professional engineer if specified.
- C. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other materials.
 - 1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
 - 2. Identification: Permanently attach label on unexposed side of Samples that includes the following:
 - a. Project name and submittal number.
 - b. Generic description of Sample.
 - c. Product name and name of manufacturer.
 - d. Sample source.
 - e. Number and title of applicable Specification Section.

- f. Specification paragraph number and generic name of each item.
- 3. Email Transmittal: Provide PDF transmittal. Include digital image file illustrating Sample characteristics, and identification information for record.
- 4. Optional Web-Based Project Software: Prepare submittals in PDF form, and upload to web-based Project software website. Enter required data in web-based software site to fully identify submittal.
- 5. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
 - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
 - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
- 6. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
 - a. Number of Samples: Submit one full set(s) 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. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
 - a. Number of Samples: Submit Two sets of Samples. Architect will retain Oner Sample sets; remainder will be returned.
 - 1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
 - 2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least Two sets of paired units that show approximate limits of variations.
- D. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
 - 1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.

- 2. Manufacturer and product name, and model number if applicable.
- 3. Number and name of room or space.
- 4. Location within room or space.
- E. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.
- F. Design Data: Prepare and submit written and graphic information indicating compliance with indicated performance and design criteria in individual Specification Sections. Include list of assumptions and summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Number each page of submittal.
- G. Certificates:
 - 1. Certificates and Certifications Submittals: Submit a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity. Provide a notarized signature where indicated.
 - 2. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
 - 3. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
 - 4. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
 - 5. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
 - 6. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.
- H. Test and Research Reports:
 - 1. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
 - 2. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
 - 3. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

- 4. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
- 5. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- 6. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
 - a. Name of evaluation organization.
 - b. Date of evaluation.
 - c. Time period when report is in effect.
 - d. Product and manufacturers' names.
 - e. Description of product.
 - f. Test procedures and results.
 - g. Limitations of use.

1.8 DELEGATED-DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
 - 1. If criteria indicated are insufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF file and paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
 - 1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

1.9 CONTRACTOR'S REVIEW

A. Action Submittals and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.

- B. Contractor's Approval: Indicate Contractor's approval for each submittal with a uniform approval stamp. Include 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.
 - 1. Architect will not review submittals received from Contractor that do not have Contractor's review and approval.

1.10 ARCHITECT'S REVIEW

- A. Action Submittals: Architect will review each submittal, indicate corrections or revisions required, and return it.
 - 1. PDF Submittals: Architect will indicate, via markup on each submittal, the appropriate action
- B. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
- C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.
- D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- E. Architect will discard submittals received from sources other than Contractor.
- F. Submittals not required by the Contract Documents will be returned by Architect without action.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013300

SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspection services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specific quality-assurance and quality-control requirements for individual work results are specified in their respective Specification Sections. Requirements in individual Sections may also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.
 - 3. Requirements for Contractor to provide quality-assurance and quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
 - 4. Specific test and inspection requirements are not specified in this Section.
- C. Related Requirements:
 - 1. Section 012100 "Allowances" for testing and inspection allowances.

1.3 DEFINITIONS

- A. Field Quality-Control Tests: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- B. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, assembly, and similar operations.
 - 1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).

- C. Mockups: Full-size physical assemblies that are constructed on-site either as freestanding temporary built elements or as part of permanent construction. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.
 - 1. Integrated Exterior Mockups: Mockups of the exterior envelope constructed on-site as freestanding temporary built elements or as part of permanent construction, consisting of multiple products, assemblies, and subassemblies.
 - 2. Room Mockups: Mockups of typical interior spaces complete with wall, floor, and ceiling finishes; doors; windows; millwork; casework; specialties; furnishings and equipment; and lighting.
- D. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.
- E. Product Tests: Tests and inspections that are performed by a nationally recognized testing laboratory (NRTL) according to 29 CFR 1910.7, by a testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program (NVLAP), or by a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
- F. Source Quality-Control Tests: Tests and inspections that are performed at the source; for example, plant, mill, factory, or shop.
- G. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- H. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- I. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Contractor's quality-control services do not include contract administration activities performed by Architect[or Construction Manager].

1.4 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

1.5 CONFLICTING REQUIREMENTS

- A. Conflicting Standards and Other Requirements: If compliance with two or more standards or requirements are specified 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.

1.6 ACTION SUBMITTALS

- A. Shop Drawings: For integrated exterior mockups.
 - 1. Include plans, sections, and elevations, 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. Delegated-Design Services Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit a statement signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Contractor's quality-control personnel.
- B. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility submitted to authorities having jurisdiction before starting work on the following systems:
 - 1. Seismic-force-resisting system, designated seismic system, or component listed in the Statement of Special Inspections.
 - 2. Main wind-force-resisting system or a wind-resisting component listed in the Statement of Special Inspections.

- C. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- D. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
 - 1. Specification Section number and title.
 - 2. Entity responsible for performing tests and inspections.
 - 3. Description of test and inspection.
 - 4. Identification of applicable standards.
 - 5. Identification of test and inspection methods.
 - 6. Number of tests and inspections required.
 - 7. Time schedule or time span for tests and inspections.
 - 8. Requirements for obtaining samples.
 - 9. Unique characteristics of each quality-control service.
- E. Reports: Prepare and submit certified written reports and documents as specified.
- F. Permits, Licenses, and Certificates: For Owner's record, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents established for compliance with standards and regulations bearing on performance of the Work.

1.8 REPORTS AND DOCUMENTS

- A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
 - 1. Date of issue.
 - 2. Project title and number.
 - 3. Name, address, telephone number, and email address of testing agency.
 - 4. Dates and locations of samples and tests or inspections.
 - 5. Names of individuals making tests and inspections.
 - 6. Description of the Work and test and inspection method.
 - 7. Identification of product and Specification Section.
 - 8. Complete test or inspection data.
 - 9. Test and inspection results and an interpretation of test results.
 - 10. Record of temperature and weather conditions at time of sample taking and testing and inspection.
 - 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
 - 12. Name and signature of laboratory inspector.
 - 13. Recommendations on retesting and reinspecting.
- B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:

- 1. Name, address, telephone number, and email address of technical representative making report.
- 2. Statement on condition of substrates and their acceptability for installation of product.
- 3. Statement that products at Project site comply with requirements.
- 4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
- 5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
- 6. Statement whether conditions, products, and installation will affect warranty.
- 7. Other required items indicated in individual Specification Sections.
- C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:
 - 1. Name, address, telephone number, and email address of factory-authorized service representative making report.
 - 2. Statement that equipment complies with requirements.
 - 3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 - 4. Statement whether conditions, products, and installation will affect warranty.
 - 5. Other required items indicated in individual Specification Sections.

1.9 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units. 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 are similar in material, design, and extent to those indicated for this Project.

- F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
 - 1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.
- G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspection indicated, as documented according to [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 installation 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:
 - 1. Contractor responsibilities include the following:
 - a. Provide test specimens representative of proposed products and construction.
 - b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
 - c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
 - d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
 - e. When testing is complete, remove test specimens and test assemblies, and mockups; do not reuse products on Project.
 - 2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, 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.
- 3. Notify Architectseven days in advance of dates and times when mockups will be constructed.
- 4. Employ supervisory personnel who will oversee mockup construction. Employ workers that 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 approval of mockups before starting corresponding work, fabrication, or construction.
 - a. Allow seven days for initial review and each re-review of each mockup.
- 7. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
- 8. Demolish and remove mockups when directed unless otherwise indicated.
- L. Integrated Exterior Mockups: Construct integrated exterior mockup according to approved Shop 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.
- M. Room Mockups: Construct room mockups according to approved Shop Drawings incorporating required materials and assemblies, finished according to requirements. Provide required lighting and additional lighting where required to enable Architect to evaluate quality of the Work. Comply with requirements in "Mockups" Paragraph.
- N. Coordinate with architect and owner to provide room mockups of the following rooms:
 - 1. One Typical1 bedroom unit, to be used as model unit. Unit to be selected by Owner and Architect.
 - 2. One Typical 2 bedroom unit, to be used as model unit. Unit to be selected by Owner and Architect.
 - 3. One Typical Studio, to be used as model unit. Unit to be selected by Owner and Architect.

1.10 QUALITY CONTROL

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
 - 1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspection they are engaged to perform.
 - 2. Payment for these services will be made from testing and inspection allowances, as authorized by Change Orders.
 - 3. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.

- B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities, whether specified or not, to verify and document that the Work complies with requirements.
 - 1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
 - 2. Engage a qualified testing agency to perform quality-control services.
 - a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
 - 3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspection will be performed.
 - 4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 - 5. Testing and inspection requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 - 6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- D. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
 - 1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 - 2. Determine the locations from which test samples will be taken and in which in-situ tests are conducted.
 - 3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
 - 4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
 - 5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
 - 6. Do not perform duties of Contractor.
- E. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300 "Submittal Procedures."

- F. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.
- G. Associated Contractor Services: Cooperate with agencies and representatives performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
 - 1. Access to the Work.
 - 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 - 3. Adequate quantities of representative samples of materials that require testing and inspection. Assist agency in obtaining samples.
 - 4. Facilities for storage and field curing of test samples.
 - 5. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 - 6. Security and protection for samples and for testing and inspection equipment at Project site.
- H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspection.
 - 1. Schedule times for tests, inspections, obtaining samples, and similar activities.

1.11 SPECIAL TESTS AND INSPECTIONS

- A. Special Tests and Inspections: Owner will engage a qualified special inspector to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, as indicated in the Statement of Special Inspections attached to this Section, and as follows:
 - 1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
 - 2. Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
 - 3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.
 - 4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
 - 5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
 - 6. Retesting and reinspecting corrected work.

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

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

3.2 REPAIR AND PROTECTION

- A. General: On completion of testing, inspection, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
 - 1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 017300 "Execution."

- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
- B. Related Requirements:
 - 1. Section 011000 "Summary" for work restrictions and limitations on utility interruptions.
 - 2. Section 312319 "Dewatering" for disposal of ground water at Project site.

1.3 USE CHARGES

- A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities engaged in the Project to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Architect, testing agencies, and authorities having jurisdiction.
- B. Sewer Service: Pay sewer-service use charges for sewer usage by all entities for construction operations.
- C. Water Service: Pay water-service use charges for water used by all entities for construction operations.
- D. Electric Power Service: Pay electric-power-service use charges for electricity used by all entities for construction operations.

1.4 INFORMATIONAL SUBMITTALS

- A. Site Utilization Plan: Show temporary facilities, temporary utility lines and connections, staging areas, construction site entrances, vehicle circulation, and parking areas for construction personnel.
- B. Implementation and Termination Schedule: Within 15 days of date established for commencement of the Work, submit schedule indicating implementation and termination dates of each temporary utility.

- C. Project Identification and Temporary Signs: Show fabrication and installation details, including plans, elevations, details, layouts, typestyles, graphic elements, and message content.
- D. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.
- E. Moisture- and Mold-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage and mold.

1.5 QUALITY ASSURANCE

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

1.6 PROJECT CONDITIONS

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

PART 2 - PRODUCTS

2.1 MATERIALS

- Chain-Link Fencing: Minimum 2-inch, 0.148-inch- thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch- OD line posts and 2-7/8-inch- OD corner and pull posts, with 1-5/8-inch- OD top rails, with galvanized barbed-wire top strand.
- B. Portable Chain-Link Fencing: Minimum 2-inch, 0.148-inch- thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch- OD line posts and 2-7/8-inch- OD corner and pull posts, with 1-5/8-inch- OD top and bottom rails. Provide concrete galvanized-steel bases for supporting posts.
- C. Fencing Windscreen Privacy Screen: Polyester fabric scrim with grommets for attachment to chain link fence, sized to height of fence, in color selected by Architect from manufacturer's standard colors.
- D. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10-mil minimum thickness, with flame-spread rating of 15 or less per ASTM E 84 and passing NFPA 701 Test Method 2.

E. Dust-Control Adhesive-Surface Walk-Off Mats: Provide mats minimum 36 by 60 inches.

2.2 TEMPORARY FACILITIES

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

2.3 EQUIPMENT

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

PART 3 - EXECUTION

- 3.1 TEMPORARY FACILITIES, GENERAL
 - A. Conservation: Coordinate construction and use of temporary facilities with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

3.2 INSTALLATION, GENERAL

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

3.3 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
 - 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
 - 1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.
- C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.
- D. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
 - 1. Toilets: Use of Owner's existing toilet facilities will be permitted, as long as facilities are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.
- E. Temporary Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
- F. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
 - 1. Install electric power service overhead unless otherwise indicated.
 - 2. Connect temporary service to Owner's existing power source, as directed by Owner.
- G. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
 - 1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

3.4 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:

- 1. Provide construction for temporary offices, shops, and sheds located within construction area or within 30 feet of building lines that is noncombustible according to ASTM E 136. Comply with NFPA 241.
- 2. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
- B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas within construction limits indicated on Drawings.
 - 1. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.
- C. Temporary Use of Planned Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.
 - 1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
 - 2. Prepare subgrade and install subbase and base for temporary roads and paved areas according to Section 312000 "Earth Moving."
 - 3. Recondition base after temporary use, including removing contaminated material, regrading, proofrolling, compacting, and testing.
 - 4. Delay installation of final course of permanent hot-mix asphalt pavement until immediately before Substantial Completion. Repair hot-mix asphalt base-course pavement before installation of final course according to Section 321216 "Asphalt Paving."
- D. Traffic Controls: Comply with requirements of authorities having jurisdiction.
 - 1. Protect existing site improvements to remain including curbs, pavement, and utilities.
 - 2. Maintain access for fire-fighting equipment and access to fire hydrants.
- E. Parking: Parking for construction personnel to be coordinated by GC.
- F. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
 - 1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
 - 2. Remove snow and ice as required to minimize accumulations.
- G. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
 - 1. Identification Signs: Provide Project identification signs as indicated on Drawings.

- 2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
 - a. Provide temporary, directional signs for construction personnel and visitors.
- 3. Maintain and touch up signs so they are legible at all times.
- H. Waste Disposal Facilities: Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."
- I. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Section 017300 "Execution."
- J. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
 - 1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.
- K. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.
- L. Temporary Use of Permanent Stairs: Use of new stairs for construction traffic will be permitted, provided stairs are protected and finishes restored to new condition at time of Substantial Completion.

3.5 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
 - 1. Where access to adjacent properties is required in order to affect protection of existing facilities, obtain written permission from adjacent property owner to access property for that purpose.
- B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
- C. Temporary Erosion and Sedimentation Control: Comply with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent and requirements specified in Section 311000 "Site Clearing."
- D. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings.

- 1. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree- or plant-protection zones.
- 2. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
- 3. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from Project site during the course of Project.
- 4. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.
- E. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
- F. Tree and Plant Protection: Comply with requirements specified in Section 015639 "Temporary Tree and Plant Protection."
- G. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.
- H. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using materials approved by authorities having jurisdiction.
- I. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people from easily entering site except by entrance gates.
 - 1. Extent of Fence: As indicated on Drawings.
 - 2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to Owner.
- J. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each workday.
- K. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- L. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.
- M. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
 - 1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.

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

3.6 MOISTURE AND MOLD CONTROL

- A. Contractor's Moisture-Protection Plan: Describe delivery, handling, storage, installation, and protection provisions for materials subject to water absorption or water damage.
 - 1. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water-damaged Work.
 - 2. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.
 - 3. Indicate methods to be used to avoid trapping water in finished work.
- B. Exposed Construction Period: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:
 - 1. Protect porous materials from water damage.
 - 2. Protect stored and installed material from flowing or standing water.
 - 3. Keep porous and organic materials from coming into prolonged contact with concrete.
 - 4. Remove standing water from decks.
 - 5. Keep deck openings covered or dammed.
- C. Partially Enclosed Construction Period: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:
 - 1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
 - 2. Keep interior spaces reasonably clean and protected from water damage.

- 3. Periodically collect and remove waste containing cellulose or other organic matter.
- 4. Discard or replace water-damaged material.
- 5. Do not install material that is wet.
- 6. Discard and replace stored or installed material that begins to grow mold.
- 7. Perform work in a sequence that allows wet materials adequate time to dry before enclosing the material in gypsum board or other interior finishes.
- D. Controlled Construction Period: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
 - 1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
 - 2. Use temporary or permanent HVAC system to control humidity within ranges specified for installed and stored materials.
 - 3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.
 - a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective and require replacing.
 - b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for 48 hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.
 - c. Remove and replace materials that cannot be completely restored to their manufactured moisture level within 48 hours.
- 3.7 OPERATION, TERMINATION, AND REMOVAL
 - A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
 - B. Maintenance: Maintain facilities in good operating condition until removal.
 - 1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
 - C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
 - D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

- 1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
- 2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
- 3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

END OF SECTION 015000

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.
- B. Related Requirements:
 - 1. Section 012100 "Allowances" for products selected under an allowance.
 - 2. Section 012300 "Alternates" for products selected under an alternate.
 - 3. Section 012500 "Substitution Procedures" for requests for substitutions.

1.3 DEFINITIONS

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

- B. Basis-of-Design Product Specification: A specification in which a single manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation. In addition to the basis-of-design product description, product attributes and characteristics may be listed to establish the significant qualities related to type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other special features and requirements for purposes of evaluating comparable products of additional manufacturers named in the specification.
- C. Subject to Compliance with Requirements: Where the phrase "Subject to compliance with requirements" introduces a product selection procedure in an individual Specification Section, provide products qualified under the specified product procedure. In the event that a named product or product by a named manufacturer does not meet the other requirements of the specifications, select another named product or product or product from another named manufacturer that does meet the requirements of the specifications. Submit a comparable product request, if applicable.

1.4 ACTION SUBMITTALS

- A. Comparable Product Request Submittal: Submit request for consideration of each comparable product. Identify basis-of-design product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
 - 2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
 - a. Form of Architect's Approval of Submittal: As specified in Section 013300 "Submittal Procedures."
 - b. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.
- B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 013300 "Submittal Procedures." Show compliance with requirements.

1.5 QUALITY ASSURANCE

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

- 1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
- 2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.
- B. Identification of Products: Except for required labels and operating data, do not attach or imprint manufacturer or product names or trademarks on exposed surfaces of products or equipment that will be exposed to view in occupied spaces or on the exterior.
 - 1. Labels: Locate required product labels and stamps on a concealed surface, or, where required for observation following installation, on a visually accessible surface that is not conspicuous.
 - 2. Equipment Nameplates: Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate on a visually accessible but inconspicuous surface. Include information essential for operation, including the following:
 - a. Name of product and manufacturer.
 - b. Model and serial number.
 - c. Capacity.
 - d. Speed.
 - e. Ratings.
 - 3. See individual identification sections in Divisions 21, 22, 23, and 26 for additional identification requirements.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.
- B. Delivery and Handling:
 - 1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
 - 2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
 - 3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
 - 4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.
- C. Storage:
 - 1. Store products to allow for inspection and measurement of quantity or counting of units.

PRODUCT REQUIREMENTS

- 2. Store materials in a manner that will not endanger Project structure.
- 3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
- 4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
- 5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
- 6. Protect stored products from damage and liquids from freezing.
- 7. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.7 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
 - 1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
 - 2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
 - 1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
 - 2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
 - 3. See other Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Section 017700 "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

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

- 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
- 3. Owner reserves the right to limit selection to products with warranties meeting requirements of the Contract Documents.
- 4. Where products are accompanied by the term "as selected," Architect will make selection.
- 5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
- B. Product Selection Procedures:
 - 1. Sole Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements.
 - a. Sole product may be indicated by the phrase: "Subject to compliance with requirements, provide the following: ..."
 - 2. Sole Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements.
 - a. Sole manufacturer/source may be indicated by the phrase: "Subject to compliance with requirements, provide products by the following: ..."
 - 3. Limited List of Products: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will will not be considered unless otherwise indicated.
 - a. Limited list of products may be indicated by the phrase: "Subject to compliance with requirements, provide one of the following: ..."
 - 4. Non-Limited List of Products: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, which complies with requirements.
 - a. Non-limited list of products is indicated by the phrase: "Subject to compliance with requirements, available products that may be incorporated in the Work include, but are not limited to, the following: ..."
 - 5. Limited List of Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will will not be considered unless otherwise indicated.
 - a. Limited list of manufacturers is indicated by the phrase: "Subject to compliance with requirements, provide products by one of the following: ..."
 - 6. Non-Limited List of Manufacturers: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, which complies with requirements.
- a. Non-limited list of manufacturers is indicated by the phrase: "Subject to compliance with requirements, available manufacturers whose products may be incorporated in the Work include, but are not limited to, the following: ..."
- 7. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.
 - a. For approval of products by unnamed manufacturers, comply with requirements in Section 012500 "Substitution Procedures" for substitutions for convenience.
- C. Visual Matching Specification: Where Specifications require "match Architect's sample," provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
 - 1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 012500 "Substitution Procedures" for proposal of product.
- D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

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

B. Submittal Requirements: Approval by the Architect of Contractor's request for use of comparable product is not intended to satisfy other submittal requirements. Comply with specified submittal requirements.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

SECTION 017300 - EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
 - 1. Construction layout.
 - 2. Field engineering and surveying.
 - 3. Installation of the Work.
 - 4. Cutting and patching.
 - 5. Coordination of Owner-installed products.
 - 6. Progress cleaning.
 - 7. Starting and adjusting.
 - 8. Protection of installed construction.
- B. Related Requirements:
 - 1. Section 011000 "Summary" for limits on use of Project site.
 - 2. Section 013300 "Submittal Procedures" for submitting surveys.
 - 3. Section 017700 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, replacing defective work, and final cleaning.
 - 4. Section 078413 "Penetration Firestopping" for patching penetrations in fire-rated construction.

1.3 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of subsequent work.
- B. Patching: Fitting and repair work required to restore construction to original conditions after installation of subsequent work.
- 1.4 INFORMATIONAL SUBMITTALS
 - A. Qualification Data: For land surveyor.

EXECUTION

- B. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.
- C. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.
- D. Final Property Survey: Submit 10 copies showing the Work performed and record survey data.

1.5 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.
- B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
 - 1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.
 - 2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include the following:
 - a. Primary operational systems and equipment.
 - b. Fire separation assemblies.
 - c. Air or smoke barriers.
 - d. Fire-suppression systems.
 - e. Plumbing piping systems.
 - f. Mechanical systems piping and ducts.
 - g. Control systems.
 - h. Communication systems.
 - i. Fire-detection and -alarm systems.
 - j. Conveying systems.
 - k. Electrical wiring systems.
 - I. Operating systems of special construction.
 - 3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Other construction elements include but are not limited to the following:
 - a. Water, moisture, or vapor barriers.
 - b. Membranes and flashings.
 - c. Exterior curtain-wall construction.
 - d. Sprayed fire-resistive material.

- e. Equipment supports.
- f. Piping, ductwork, vessels, and equipment.
- g. Noise- and vibration-control elements and systems.
- 4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
- C. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

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

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, and other construction affecting the Work.
 - 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services; and other utilities.
 - 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

- B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
 - 1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 - 2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 - 3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
 - 1. Description of the Work.
 - 2. List of detrimental conditions, including substrates.
 - 3. List of unacceptable installation tolerances.
 - 4. Recommended corrections.
- D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Section 013100 "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

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

EXECUTION

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

3.4 FIELD ENGINEERING

- A. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
 - 1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.
 - 2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
- B. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
 - 1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
 - 2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.

EXECUTION

- 3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.
- C. Final Property Survey: Engage a land surveyor to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.
 - 1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.
 - 2. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

3.5 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 - 1. Make vertical work plumb and make horizontal work level.
 - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 - 3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
 - 4. Maintain minimum headroom clearance of 84 Inches in occupied spaces and 80 inchesn in unoccupied spaces.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.
- F. Tools and Equipment: Where possible, select tools or equipment that minimize production of excessive noise levels.
- G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other portions of the Work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

- H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
 - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
 - 2. Allow for building movement, including thermal expansion and contraction.
 - 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- J. Repair or remove and replace damaged, defective, or nonconforming Work.
 - 1. Comply with Section 017700 "Closeout Procedures" for repairing or removing and replacing defective Work.

3.6 CUTTING AND PATCHING

- A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
 - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.
- C. Temporary Support: Provide temporary support of work to be cut.
- D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching according to requirements in Section 011000 "Summary."
- F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.

- G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
 - 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 - 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 - 3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 - 4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
 - 5. Proceed with patching after construction operations requiring cutting are complete.
- H. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.
 - 1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
 - 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
 - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
 - b. Restore damaged pipe covering to its original condition.
 - 3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
 - 4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
 - 5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.

I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.7 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
 - 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 - 2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
 - 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
 - a. Use containers intended for holding waste materials of type to be stored.
 - 4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
 - 1. Remove liquid spills promptly.
 - 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 015000 "Temporary Facilities and Controls."
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.8 STARTING AND ADJUSTING

- A. Coordinate startup and adjusting of equipment and operating components with requirements in Section 019113 "General Commissioning Requirements."
- B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- E. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 "Quality Requirements."

3.9 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Protection of Existing Items: Provide protection and ensure that existing items to remain undisturbed by construction are maintained in condition that existed at commencement of the Work.
- C. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION 017300

SECTION 017419 - 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 other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for the following:
 - 1. Salvaging nonhazardous demolition and construction waste.
 - 2. Recycling nonhazardous demolition and construction waste.
 - 3. Disposing of nonhazardous demolition and construction waste.

B. Related Requirements:

- 1. Section 024116 "Structure Demolition" for disposition of waste resulting from demolition of buildings, structures, and site improvements, and for disposition of hazardous waste.
- 2. Section 024119 "Selective Demolition" for disposition of waste resulting from partial demolition of buildings, structures, and site improvements, and for disposition of hazardous waste.
- 3. Section 042000 "Unit Masonry" for disposal requirements for masonry waste.
- 4. Section 311000 "Site Clearing" for disposition of waste resulting from site clearing and removal of above- and below-grade improvements.

1.3 DEFINITIONS

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

F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.4 PERFORMANCE REQUIREMENTS

- A. General: Achieve end-of-Project rates for salvage/recycling of 50 percent by weight of total non-hazardous solid waste generated by the Work. Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials, including the following:
 - 1. Demolition Waste:
 - a. Concrete reinforcing steel.
 - b. Lighting fixtures.
 - c. Electrical devices.
 - 2. Construction Waste:
 - a. Masonry and CMU.
 - b. Lumber.
 - c. Wood sheet materials.
 - d. Wood trim.
 - e. Metals.
 - f. Roofing.
 - g. Insulation.
 - h. Carpet and pad.
 - i. Gypsum board.
 - j. Piping.
 - k. Electrical conduit.
 - I. Packaging: Regardless of salvage/recycle goal indicated in "General" Paragraph above, salvage or recycle 100 percent of the following uncontaminated packaging materials:
 - 1) Paper.
 - 2) Cardboard.
 - 3) Boxes.
 - 4) Wood crates.

1.5 ACTION SUBMITTALS

- A. Waste Management Plan: Submit plan within 30 days of date established for the Notice to Proceed.
- 1.6 INFORMATIONAL SUBMITTALS
 - A. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit report. Use Form CWM-7 for construction waste. Include the following information:

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

- 1. Material category.
- 2. Generation point of waste.
- 3. Total quantity of waste in tons.
- 4. Quantity of waste salvaged, both estimated and actual in tons.
- 5. Quantity of waste recycled, both estimated and actual in tons.
- 6. Total quantity of waste recovered (salvaged plus recycled) in tons.
- 7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.
- PART 2 PRODUCTS (Not Used)
- PART 3 EXECUTION
- 3.1 PLAN IMPLEMENTATION
 - A. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work.
 - B. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - 1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
 - 2. Comply with Section 015000 "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.
- 3.2 SALVAGING DEMOLITION WASTE
 - A. Salvaged Items for Reuse in the Work: Salvage items for reuse and handle as follows:
 - 1. Clean salvaged items.
 - 2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
 - 3. Store items in a secure area until installation.
 - 4. Protect items from damage during transport and storage.
 - 5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.
 - B. Salvaged Items for Donation: Permitted on Project site.
 - C. Salvaged Items for Owner's Use: Salvage items for Owner's use and handle as follows:
 - 1. Clean salvaged items.
 - 2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.

- 3. Store items in a secure area until delivery to Owner.
- 4. Transport items to Owner's storage area designated by Owner.
- 5. Protect items from damage during transport and storage.

3.3 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

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

3.4 RECYCLING DEMOLITION WASTE

A. Metals: Separate metals by type.

3.5 RECYCLING CONSTRUCTION WASTE

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

- B. Wood Materials:
 - 1. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.
 - a. Comply with requirements in Section 329300 "Plants" for use of clean sawdust as organic mulch.
- C. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location.
 - 1. Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.
 - a. Comply with requirements in Section 329300 "Plants" for use of clean ground gypsum board as inorganic soil amendment.

3.6 DISPOSAL OF WASTE

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

END OF SECTION 017419

SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Substantial Completion procedures.
 - 2. Final completion procedures.
 - 3. Warranties.
 - 4. Final cleaning.
 - 5. Repair of the Work.
- B. Related Requirements:
 - 1. Section 013233 "Photographic Documentation" for submitting final completion construction photographic documentation.
 - 2. Section 017823 "Operation and Maintenance Data" for additional operation and maintenance manual requirements.
 - 3. Section 017839 "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.

1.3 ACTION SUBMITTALS

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

1.4 CLOSEOUT SUBMITTALS

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

1.5 MAINTENANCE MATERIAL SUBMITTALS

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

1.6 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.
- B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
 - 1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - 2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
 - 3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - 4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect. Label with manufacturer's name and model number.
 - a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Owner's signature for receipt of submittals.
 - 5. Submit testing, adjusting, and balancing records.
 - 6. Submit sustainable design submittals not previously submitted.
 - 7. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
- C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
 - 1. Advise Owner of pending insurance changeover requirements.
 - 2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 - 3. Complete startup and testing of systems and equipment.
 - 4. Perform preventive maintenance on equipment used prior to Substantial Completion.

- 5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 017900 "Demonstration and Training."
- 6. Advise Owner of changeover in utility services.
- 7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
- 8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
- 9. Complete final cleaning requirements.
- 10. Touch up paint and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
 - 1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
 - 2. Results of completed inspection will form the basis of requirements for final completion.

1.7 FINAL COMPLETION PROCEDURES

- A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:
 - 1. Submit a final Application for Payment according to Section 012900 "Payment Procedures."
 - 2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
 - 3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 - 4. Submit pest-control final inspection report.
 - 5. Submit final completion photographic documentation.
- B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
 - 1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.8 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

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

1.9 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where warranties are indicated to commence on dates other than date of Substantial Completion, or when delay in submittal of warranties might limit Owner's rights under warranty.
- B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.
- C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
- D. Warranty Electronic File: Provide warranties and bonds in PDF format. Assemble complete warranty and bond submittal package into a single electronic PDF file with bookmarks enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
 - 1. Submit by email to Architect.
- E. Warranties in Paper Form:
 - 1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.

- 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
- 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
- F. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

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

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
 - 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
 - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
 - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - c. Rake grounds that are not planted, mulched, or paved to a smooth, even-textured surface.
 - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - e. Remove snow and ice to provide safe access to building.

- f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
- g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
- h. Sweep concrete floors broom clean in unoccupied spaces.
- i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
- j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
- k. Remove labels that are not permanent.
- I. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
- m. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
- n. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
- o. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.
- p. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
- q. Leave Project clean and ready for occupancy.
- C. Pest Control: Comply with pest control requirements in Section 015000 "Temporary Facilities and Controls." Prepare written report.
- D. Construction Waste Disposal: Comply with waste disposal requirements in Section 017419 "Construction Waste Management and Disposal."

3.2 REPAIR OF THE WORK

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

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

END OF SECTION 017700

SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
 - 1. Operation and maintenance documentation directory manuals.
 - 2. Emergency manuals.
 - 3. Systems and equipment operation manuals.
 - 4. Systems and equipment maintenance manuals.
 - 5. Product maintenance manuals.
- B. Related Requirements:
 - 1. Section 013300 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.

1.3 DEFINITIONS

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

1.4 CLOSEOUT SUBMITTALS

- A. Submit operation and maintenance manuals indicated. Provide content for each manual as specified in individual Specification Sections, and as reviewed and approved at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
 - 1. Architect will comment on whether content of operation and maintenance submittals is acceptable.
 - 2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
- B. Format: Submit operation and maintenance manuals in the following format:

- 1. Submit on digital media acceptable to Architect. Enable reviewer comments on draft submittals.
- C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Architect will comment on whether general scope and content of manual are acceptable.
- D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect will return copy with comments.
 - 1. Correct or revise each manual to comply with Architect's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's comments and prior to commencing demonstration and training.
- E. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

1.5 FORMAT OF OPERATION AND MAINTENANCE MANUALS

- A. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
 - 1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
 - 2. File Names and Bookmarks: Bookmark individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

1.6 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

- A. Organization of Manuals: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
 - 1. Title page.
 - 2. Table of contents.
 - 3. Manual contents.
- B. Title Page: Include the following information:
 - 1. Subject matter included in manual.
 - 2. Name and address of Project.
 - 3. Name and address of Owner.

OPERATION AND MAINTENANCE DATA

- 4. Date of submittal.
- 5. Name and contact information for Contractor.
- 6. Name and contact information for Construction Manager.
- 7. Name and contact information for Architect.
- 8. Name and contact information for Commissioning Authority.
- 9. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
- 10. Cross-reference to related systems in other operation and maintenance manuals.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
 - 1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

1.7 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY MANUAL

- A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals. List items and their location to facilitate ready access to desired information. Include the following:
 - 1. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
 - 2. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
 - 3. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

1.8 EMERGENCY MANUALS

A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

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

1.9 SYSTEMS AND EQUIPMENT OPERATION MANUALS

- A. Systems and Equipment Operation Manual: Assemble a complete set of data indicating operation of each system, subsystem, and piece of equipment not part of a system. Include information required for daily operation and management, operating standards, and routine and special operating procedures.
 - 1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
 - 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- B. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
 - 1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.

- 2. Performance and design criteria if Contractor has delegated design responsibility.
- 3. Operating standards.
- 4. Operating procedures.
- 5. Operating logs.
- 6. Wiring diagrams.
- 7. Control diagrams.
- 8. Piped system diagrams.
- 9. Precautions against improper use.
- 10. License requirements including inspection and renewal dates.
- C. Descriptions: Include the following:
 - 1. Product name and model number. Use designations for products indicated on Contract Documents.
 - 2. Manufacturer's name.
 - 3. Equipment identification with serial number of each component.
 - 4. Equipment function.
 - 5. Operating characteristics.
 - 6. Limiting conditions.
 - 7. Performance curves.
 - 8. Engineering data and tests.
 - 9. Complete nomenclature and number of replacement parts.
- D. Operating Procedures: Include the following, as applicable:
 - 1. Startup procedures.
 - 2. Equipment or system break-in procedures.
 - 3. Routine and normal operating instructions.
 - 4. Regulation and control procedures.
 - 5. Instructions on stopping.
 - 6. Normal shutdown instructions.
 - 7. Seasonal and weekend operating instructions.
 - 8. Required sequences for electric or electronic systems.
 - 9. Special operating instructions and procedures.
- E. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
- F. Piped Systems: Diagram piping as installed, and identify color coding where required for identification.

1.10 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Systems and Equipment Maintenance Manuals: Assemble a complete set of data indicating maintenance of each system, subsystem, and piece of equipment not part of a system. Include manufacturers' maintenance documentation, preventive maintenance procedures and frequency, repair procedures, wiring and systems diagrams, lists of spare parts, and warranty information.

- 1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
- 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- B. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranties and bonds as described below.
- C. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- D. Manufacturers' Maintenance Documentation: Include the following information for each component part or piece of equipment:
 - 1. Standard maintenance instructions and bulletins; include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
 - a. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
 - 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
 - 3. Identification and nomenclature of parts and components.
 - 4. List of items recommended to be stocked as spare parts.
- E. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
 - 1. Test and inspection instructions.
 - 2. Troubleshooting guide.
 - 3. Precautions against improper maintenance.
 - 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - 5. Aligning, adjusting, and checking instructions.
 - 6. Demonstration and training video recording, if available.
- F. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

- 1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, guarterly, semiannual, and annual frequencies.
- 2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
- G. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- H. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
- I. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
 - 1. Include procedures to follow and required notifications for warranty claims.
- J. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
 - 1. Do not use original project record documents as part of maintenance manuals.

1.11 PRODUCT MAINTENANCE MANUALS

- A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- B. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- C. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- D. Product Information: Include the following, as applicable:
 - 1. Product name and model number.
 - 2. Manufacturer's name.
 - 3. Color, pattern, and texture.
 - 4. Material and chemical composition.
 - 5. Reordering information for specially manufactured products.
- E. Maintenance Procedures: Include manufacturer's written recommendations and the following:

- 1. Inspection procedures.
- 2. Types of cleaning agents to be used and methods of cleaning.
- 3. List of cleaning agents and methods of cleaning detrimental to product.
- 4. Schedule for routine cleaning and maintenance.
- 5. Repair instructions.
- F. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- G. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
 - 1. Include procedures to follow and required notifications for warranty claims.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 017823

SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for project record documents, including the following:
 - 1. Record Drawings.
 - 2. Record Specifications.
 - 3. Record Product Data.
- B. Related Requirements:
 - 1. Section 017300 "Execution" for final property survey.
 - 2. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.2 CLOSEOUT SUBMITTALS

- A. Record Drawings: Comply with the following:
 - 1. Number of Copies: Submit copies of record Drawings as follows:
 - a. Final Submittal:
 - 1) Submit record digital data files via file transfer or flash drive to architect, owner and lender.
- B. Record Specifications: Submit annotated PDF electronic files of Project's Specifications, including addenda and contract modifications.
- C. Record Product Data: Submit annotated PDF electronic files and directories of each submittal.
 - 1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.

1.3 RECORD DRAWINGS

A. Record Prints: Maintain one set of digital data files (pdf format) of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.

- 1. Preparation: Mark record files to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
 - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - b. Accurately record information in an acceptable drawing technique.
 - c. Record data as soon as possible after obtaining it.
 - d. Record and check the markup before enclosing concealed installations.
 - e. Cross-reference record prints to corresponding photographic documentation.
- 2. Content: Types of items requiring marking include, but are not limited to, the following:
 - a. Dimensional changes to Drawings.
 - b. Revisions to details shown on Drawings.
 - c. Depths of foundations.
 - d. Locations and depths of underground utilities.
 - e. Revisions to routing of piping and conduits.
 - f. Revisions to electrical circuitry.
 - g. Actual equipment locations.
 - h. Duct size and routing.
 - i. Locations of concealed internal utilities.
 - j. Changes made by Change Order or Construction Change Directive.
 - k. Changes made following Architect's written orders.
 - I. Details not on the original Contract Drawings.
 - m. Field records for variable and concealed conditions.
 - n. Record information on the Work that is shown only schematically.
- 3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record files..
- 4. Mark important additional information that was either shown schematically or omitted from original Drawings.
- 5. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record files with Architect. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:
 - 1. Format: Annotated PDF electronic file with comment function enabled.
 - 2. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
 - 3. Refer instances of uncertainty to Architect for resolution.
 - 4. Architect will furnish Contractor with one set of digital data files of the Contract Drawings for use in recording information.

- a. See Section 013100 "Project Management and Coordination" for requirements related to use of Architect's digital data files.
- b. Architect will provide data file layer information. Record markups in separate layers.

1.4 RECORD SPECIFICATIONS

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

1.5 RECORD PRODUCT DATA

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

1.6 MAINTENANCE OF RECORD DOCUMENTS

A. Maintenance of Record Documents: Store record documents in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's reference during normal working hours.

PART 2 - PRODUCTS

PART 3 - EXECUTION

END OF SECTION 017839
SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 SUMMARY

- A. Provide labor, materials, equipment and services necessary for and reasonably incidental to the completion of all cast-in-place concrete work shown or herein specified. The work includes all concrete poured in placed with the required reinforcement called for on the drawings, concrete forms and forming, concrete over metal decking, pads under mechanical and electrical equipment and special pads as shown and noted on drawings. Coordinate concrete work with other trades and ensure the insertion of all cast-in-place items at the proper time.
- B. Supported Slabs on Steel Beams or Joists: The steel beams and joist have been designed to industry deflection standards. Account for steel beam and joist deflection in the estimating of the concrete quantities and the placement of concrete.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume.

1.4 QUALITY ASSURANCE

- A. Contractor Qualifications: A company who specializes in the placement of formwork, reinforcing steel, and concrete with a minimum of 3 years experience on projects of a similar size and scope.
- B. Specialty Engineer Qualifications: Professional Engineer registered in the State of the proposed project whose specialty includes the structural design of concrete formwork.
 - 1. The Specialty Engineer will be required to perform periodic site observations to confirm the formwork construction meets the requirements of the formwork drawings.
 - 2. The Specialty Engineer shall carry professional liability insurance coverage in the aggregate amount of \$250,000.00 to protect the Engineer from claims, which may arise in the performance of engineering services

- C. Codes and Standards: Comply with provisions of following codes, specifications and standards, except where more stringent requirements are shown or specified. ACI 301 'Specifications for Structural Concrete for Buildings'; ACI 117 'Specifications for Tolerance for Concrete Construction and Materials, and CRSI Concrete Reinforcing Steel Institute, 'Manual of Standard Practice'.
- D. Workmanship: The Contractor is responsible for correction of concrete work which does not conform to the specified requirements, including strength, tolerances and finishes. Correct deficient concrete as directed by Architect.
- E. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly, and support of formwork. Design and engineering of formwork are Contractor's responsibility.
 - 1. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and installing and removing reshoring.
- F. Pre-Construction Conference: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings" and the following.
 - 1. At least 10 days prior to submittal of design mixes, conduct a meeting to review detailed requirements for preparing concrete design mixes and to determine procedures for satisfactory concrete operations. Review requirements for submittals, status of coordinating work, and availability of materials. Establish preliminary work progress schedule and procedures for materials inspection, testing, and certifications. Request that representatives of each entity directly concerned with cast-in-place concrete attend conference, including, but not limited to, the following:

2. Contractor's superintendent and project manager; Laboratory responsible for field quality control; Ready-mix concrete producer; Concrete subcontractor; Primary admixture manufacturers; Architect or Owner's representative; Structural engineer.

- G. Materials and Installed work may require testing and retesting, as directed by Architect, at anytime during progress of work. Allow free access to material stockpiles and facilities. Tests, not specifically indicated to be done at Owner's expense, including retesting of rejected materials and installed work, shall be done at Contractor's expense.
- H. Protection of Footings Against Freezing: Cover completed work at footing level with sufficient temporary or permanent cover as required to protect footings and adjacent subgrade against possibility of freezing; maintain cover for time period as necessary.
- I. Protect adjacent finish materials against spatter during concrete placement.

1.5 SUBMITTALS

- A. Shop Drawings Reinforcement: Submit shop drawings for fabrication, bending, and placement of concrete reinforcement. Comply with ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures" showing bar schedules, stirrup spacing, diagrams of bent bars, and arrangement of concrete reinforcement. Include special reinforcement required at openings through concrete structures and construction joints. Show wall reinforcing in elevations, in addition to section.
 - 1. Structural design drawings shall not be reproduced or used as base sheets for shop drawings.
 - CAD files of the structural drawings are available for use by the contractor for a standard processing fee. If files are desired, contact Ehlert/Bryan, Inc. at 703-827-9552.
- B. Shop Drawings Formwork: Submit shop drawings signed and sealed by a Specialty Engineer as indicated. Show general construction of forms including jointing, special form joint or reveals, sequence of stripping formwork, sharing removal, and installing and removing reshores. Provide calculations on required levels of shoring included reshoring placement and required supporting floor concrete strengths.
 - 1. The formwork Specialty Engineer shall submit written field observation reports to the Architect/Engineer within 7 days of each visit.
 - 2. The formwork Specialty Engineer shall submit to the Architect/Engineer certification verifying liability insurance coverage with the first submission of formwork shop drawings.
 - 3. Review is for general architectural applications and features only. Design of formwork for structural stability and efficiency is Contractor's responsibility.
- C. Samples: Upon request, submit samples of chairs, spacers, waterstops, joint materials, and other materials as requested by Architect, including names, sources and descriptions.
- D. Mix Design: Submit mix designs for all classes of concrete including aggregate gradation and actual properties.
- E. Mill Test: Upon request, submit certified mill test reports for specified cement, reinforcement and welded wire fabric.
- F. Pour Sequence Plan: Submit plan showing approximate locations of concrete pour construction joints. Generally place construction joints in supported concrete construction at 1/3 points of the beam and slab spans.
- G. Certification for Admixture: Provide material certification, signed by manufacturer and contractor, certifying that each admixture complies with, or exceeds, specified requirements. Chloride ion content must be included.
- H. Related Materials: Upon request, submit cut sheets and product information on curing compounds, patching and bonding materials, sealers, minutes of preconstruction conference, and other items.

PART 2 - PRODUCTS

2.1 FORM MATERIALS

- A. Forms for Exposed Finish Concrete: Unless otherwise indicated, construct formwork for exposed concrete surfaces with plywood, metal, metal-framed plywood faced or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings. Provide form material with sufficient thickness to withstand pressure of newly-placed concrete without bow or deflection.
- B. Forms for Unexposed Finish Concrete: Form concrete surfaces which will be unexposed in finished structure with plywood, lumber, metal or other acceptable material. Provide lumber dressed on at least 2 edges and one side for tight fit.
- C. Form Coatings: Provide commercial formulation form-coating compounds that will not bond with, stain nor adversely affect concrete surfaces, and will be compatible with and not impair subsequent treatments of concrete surfaces, such as sealants or dampproofing.
- D. Form Ties: Steel wire snap ties with positive breakbacks which will leave no metal closer than 1" from formed surface of concrete, leaving a cone-shaped recess.
- E. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch minimum.
- F. Forms for Cylindrical Columns, Pedestals and Supports; Metal, glass-fiber-reinforced plastic, paper of fiber tubes that will produce surfaces with gradual or abrupt irregularities, not exceeding specified formwork surface class. Provide unites with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.

2.2 REINFORCING MATERIALS

- A. Reinforcing Bars: ASTM A615 615M, Grade 60 deformed.
- B. Epoxy Coated Reinforcing Bars: ASTM A775/A 775M, Grade 60 deformed steel.
- C. Welded Wire Fabric: ASTM A1064, welded steel wire fabric.

2.3 REINFORCING ACCESSORIES

A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete or fiber-reinforced concrete of greater compressive strength than concrete, and as follows:

- 1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected or CRSI Class 2 stainless-steel bar supports.
- 2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.
- B. Joint Dowel Bars: Plain-steel bars, ASTM A 615/ A 615M, Grade 60. Saw (do not shear) bars true to length with ends square and free of burrs.
- C. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating; compatible with epoxy coating on reinforcement and complying with ASTM A 775/A 755M.

2.4 CONCRETE MATERIALS

- A. Portland Cement: ASTM C150, Type I. Use one brand of cement throughout project.
- B. Blended Hydraulic Cement: ASTM C595M, Type 1S or 1P.
- C. Fly Ash: ASTM C618, Class C or F.
- D. Granulated Blast Furnace Slag: ASTM C989 Grade 120
- E. Normal Weight Aggregates: ASTM C33, and as herein specified. Maximum aggregate size 1" for all concrete.
 - 1. Local aggregates not complying with ASTM C 33 but which have shown by special test or actual service to produce concrete adequate strength and durability may be used when acceptable to the Architect.
- F. Lightweight Aggregate: ASTM C330
 - 1. Nominal Maximum aggregate size: 1 inch.
- G. Water: Potable and complying with ASTM C 94.

2.5 ADMIXTURES

- A. General: Admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material and to be compatible with other admixtures and cementitious materials. Do not use admixtures containing calcium chloride.
- B. Corrosion Inhibitor: ASTM C 494, Type C. Add a corrosion inhibiting admixture to

on the drawings. The admixture shall be DCI as manufactured by Grace Construction Products.

- C. Air-Entraining Admixture: ASTM C 260.
- D. Water-Reducing Admixture: ASTM C 494, Type A.

CAST-IN-PLACE CONCRETE

- E. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
- F. Water-Reducing and Accelerating Admixture: ASTM C 494, Type E.
- G. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.
- H. Calcium Chloride: Calcium chloride, thiocyanates or admixtures containing more than 0.10% water soluble chloride ions by weight of total cementitious materials are not permitted. The use of calcium chloride in concrete is prohibited.

2.6 RELATED MATERIALS

- A. Vapor Barrier: Provide moisture barrier cover over prepared base material. Use only materials which are resistant to decay when tested in accordance with ASTM E 154. Polyethylene sheet not less than 10 mils thick.
- B. Non-Shrink Grout: The grout shall conform to CRD-C 621-83, "Corps of Engineers Specification for Non-Shrink Grout". Acceptable products "Masterflow 713"; Master Builders, "Euco-NS Grout"; Euclid Chemical Company, "Five Star Grout"; US Grout Corporation.
- Membrane-Forming Curing and Sealing Compound: ASTM C1315. The compound shall be a water-based acrylic polymer blend, high solids (25% solids content minimum), low VOC (700 g/L maximum) type curing and sealing compound. (Sodium Silicate Compounds are prohibited.) Acceptable products or approved equal. "Super Diamond Clear VOX"; Euclid Chemical Company, "Cure and Seal WB 25"; SpecChem, "MasterKure CC 1315WBs"; BASF Corporation.
- D. Dissipating Resin Curing Compound: ASTM 309. The compound shall be a liquid membrane forming curing compound, low VOC (100 g/L maximum) formulated from water-based resin that breaks down quickly to allow the subsequent application

Chemical Company.

- E. Waterproof Sheet Curing Material: The compound shall conform to ASTM C-171.
- F. Bonding Compound: Polyvinyl acetate or acrylic base, rewettable type, for use only in areas not subject to moisture. Acceptable products or approved equal "Eucoweld"; Euclid Chemical Company. "Weldcrete"; By the Lamson Company.
- G. Epoxy Adhesive: ASTM C881, two component material suitable for use on dry or damp surfaces. Acceptable products or approved equal; "Sikadur Hi-Mod"; Sika Chemical Corp., "Euco Epoxy #452 or #620"; Euclid Chemical Company.
- H. Patching Mortar: Free-flowing, polymer-modified cementitious coating. Acceptable products, or approved equal, "Euco Thin Coat"; Euclid Chemical Company, "Sika Top 121"; Sika Chemical Corp.

- I. Reglets: Where resilient or elastomeric sheet flashing or bituminous membranes are terminated in reglets, provide reglets of not less than 0.0217 inch thick (26-gage) galvanized sheet steel. Fill reglet or cover face opening to prevent intrusion of concrete or debris.
- J. Joint Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber, or ASTM D 1752, cork or self-expanding cork.
- K. Epoxy Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Shore A hardness of 80 per ASTM D 2240.
- L. Waterstop: CE CRD-C 572 polyvinylchloride plastic dumb-bell or ribbed type extruded water stop for all construction joints in concrete foundation walls and wherever noted on plans to prevent passage of fluid through joint. Factory fabricate corners, intersections and directional changes.
- M. Self-Expanding Strip Waterstop: Bentonite waterproofing compound specifically formulated to be used as self-healing rectangular strip joint water system.
- N. Dovetail Anchor Slots: Hot-dip galvanized sheet steel, not less than 0.0336 inch thick (22 gage) with bent tab anchors. Fill slot with temporary filler or cover face opening to prevent intrusion of concrete or debris.
- O. Shelf Angle Wedge Inserts: Malleable iron insert with ¼ inch diameter askew head bolts and standard nut with washer. Ultimate capacity of anchors shall be a minimum of 18,000 pounds and finish to be hot dip galvanized. Inserts shall be cast with a minimum of 1½ inch of concrete below bottom. Acceptable products or

Company.

- 2.7 PROPORTIONING AND DESIGN OF MIXES
 - A. Mix Designs: Prepare mix designs for each type of strength of concrete. All mix designs shall be proportioned in accordance with Section 5.3, "Proportioning on the Basis of Field Experience and/or Trial Mixtures" of ACI 318.
 - B. Limit use of fly ash to not exceed 25 percent of total cementitious material content by weight.
 - C. Limit use of blast furnace slag to 50 percent of total cementitious material content by weight. Use of ground blast furnace slag in interior slabs is not permitted.
 - D. Contractor is cautioned to carefully consider the use of Blended Hydraulic Cements during cold weather due to its tendency to retard concrete curing. The Contractor and the concrete supplier are responsible for selecting the concrete design mix to prevent problems with curing and finishing during cold weather.

- E. Submit written reports to the Architect of each proposed mix for each class of concrete at least 30 days prior to start of work. Do not begin concrete production until mixes have been reviewed by the Architect. Reports shall include organic content, sieve analysis, specific gravity of aggregates; proportion of all materials; brand of cement; admixtures; slump; water/cement ratios; percentage of air, and results of 7-day and 28-day compression tests.
- F. Strength: Concrete shall have compressive strengths at 28 days as shown on structural drawings.
- G. Lightweight Structural Concrete: Lightweight aggregate and concrete shall conform to ASTM C330. Proportion mix to produce concrete with a minimum compressive strength of 3000 psi at 28 days and an air dry unit weight of 110 pcf plus or minus 3 pcf as determined by ASTM C567. Concrete slump at the point of placement shall not exceed 5 inches. Maximum slump shall be 6 inches (at truck discharge point) for pumped concrete and 5 inches elsewhere. Air entrain concrete to have an air content at point of discharge of 4% to 7%.
- H. Water/Cement Ratio: All concrete shall have a water/cement ratio not to exceed 0.58, except concrete for garages, exterior plazas, and concrete exposed to freezing and thawing shall have a water/cement ratio not exceeding 0.40.
- I. Air Content: All concrete exposed to freezing and thawing and/or required to be watertight shall have an air content of 6 +/- 1.5 percent.
- J. Admixture Usage: All concrete shall contain the specified water reducing admixture and/or the specified high range water reducing admixture (superplasticizer). All concrete required to be air entrained shall contain an approved air entraining admixture. All pumped concrete, concrete for industrial slabs, architectural concrete, concrete required to be watertight and concrete with a water/cement ratio below 0.50 shall contain the specified HRWR (superplasticizer).
- K. Limit water soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
- L. Concrete Topping Mix: For toppings less than 2" in thickness, the concrete mix shall achieve a compressive strength of 4000 psi at 28 days with a maximum water/cement ratio of 0.50 and a maximum size of coarse aggregate of 3/8". The mix design shall be proportioned in accordance with Section 5.3 of ACI 318.
- M. Adjustment to Concrete Mixes: Mix design and adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant; at no additional cost to Owner and as accepted by Architect. Laboratory test data for revised mix design and strength results must be submitted to and reviewed by the Architect prior to use.
- N. Slump Limits: All concrete shall have a maximum slump of 5 inches (4 inches +/- 1 inch), except concrete containing HRWR admixture (super plasticizer) which shall have a slump not more than 8 inches after addition of HRWR to site-verified 2-3 inch slump concrete.

2.8 CONCRETE MIXING

- A. Ready-Mix Concrete: Comply with the requirements of ASTM C94, and as herein specified.Select only one of the next two paragraphs Furnish batch ticket information.
 - During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C94 may be required. When the air temperature is above 85 degrees F., reduce the mixing and delivery time from 90 to 60 minutes.
 - 2. For concrete materials arriving at site with insufficient slump, the one time limited addition of water is permitted. Add up to 10 gallons of water per 9 yard truck to increase slump to specified limits. Such additions shall be clearly noted on the delivery ticket.

PART 3 - EXECUTION

3.1 FORMS

- A. Design, erect, support, brace and maintain formwork according to ACI 301 to support vertical and lateral loads that might be applied until such loads can be supported by concrete structure. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation and position.
- B. Design formwork to be readily removable without impact, shock or damage to cast-in-place concrete surfaces and adjacent materials.
- C. Construct forms complying with ACI 117, to sizes, shapes, lines and dimensions shown, and to obtain accurate alignment, location, grades, level and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in work. Use selected materials to obtain required finishes. Solidly butt joints and provide backup at joints to prevent leakage of cement paste.
- D. Provide temporary openings where interior area of formwork is inaccessible for cleanout for inspection before concrete placement, and for placement of concrete.
- E. Chamfer exposed corners and edges using wood, metal, PVC or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.
- F. Precaution: Do not build sleeves, conduits, outlet boxes, pipes into forms for joists or beams without prior approval of the Architect.
- G. Form Ties: Install ties to prevent form deflection, and to prevent spalling concrete surfaces upon removal.

- H. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses and chases from trades providing such items. Accurately place and securely support items built into forms.
- I. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt or other debris just before concrete is placed. Retighten forms and bracing after concrete placement if required to eliminate mortar leaks and maintain proper alignment.
- J. Coat contact surfaces of forms with a form coating compound before reinforcement is placed.

3.2 PLACING REINFORCEMENT

- A. Comply with specified codes and standards, and comply with Concrete Reinforcing Steel Institute's Manual of Standard Practice for placing reinforcements.
- B. Clean reinforcement of loose rust and mill scale, earth, ice and other materials, which reduce or destroy bond with concrete.
- C. Accurately position, support and secure reinforcement against displacement by formwork, construction, or concrete placement operations before concrete is placed. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and
- D. Place reinforcement to obtain at least minimum coverages for concrete protection. Arrange, space and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.
- E. Concrete cover: Protect reinforcing by thickness of concrete indicated on drawings. Where not otherwise shown thickness over reinforcement shall be as follows:

1. Provide clear distance to outermost reinforcing as follows:

2. Earth	Concrete Cast Against 3 inches
3.	Concrete Exposed to Earth or Weather:
4.	#5 or smaller 1-1/2 inches
5.	#6 or Larger 2 inches
6.	Other Concrete:
7.	Slabs & Walls

033000 - 10

- F. Epoxy-Coated Reinforcement: Use epoxy-coated steel wire ties to fasten epoxy-coated reinforcement. Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963/D 3963M.
- G. In Slabs-on-Grade: Place reinforcing in top 1/3 of depth unless otherwise noted.
- H. Install welded wire fabric in as long lengths as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset end laps in adjacent widths to prevent continuous laps in either direction.
- I. At construction joints, no reinforcing steel shall terminate within 60 diameters of joint; provide additional reinforcement as shown on drawings.
- J. Splice Limitations: Make no splices in reinforcement, except as shown on drawings or authorized by Structural Engineer. Lap approved splices in continuous reinforcing minimum of 30 diameters, unless noted otherwise. In slabs, beams, and girders, do not splice reinforcement at points of maximum stress. At slabs and walls where bars lap or splice, stagger splices in adjacent bars. Lap splices in columns, piers, struts, sufficiently to transfer full stress by concrete bond.

3.3 JOINTS

- A. Construction Joints Supported Concrete: Locate and install construction joints as indicated or, if not indicated, so as not to impair strength and appearance of the structure, as acceptable to Architect. Generally, construction joints shall be placed at 1/3 span for concrete slabs and beams.
- B. Construction and Control Joints Walls and Slab on Grade: Locate and install as indicated or, if not indicated, so as not to impair the strength and appearance of the structure, as acceptable by the Architect.
- C. Contraction (Control) Joints in Slabs-on-Ground: Construct contraction joints in slabs-on-ground to form panels of patterns as shown. Use saw cuts 1/8 inch wide by 1/4 slab depth or inserts 1/4 inch wide by 1/4 of slab depth, unless otherwise indicated. Saw cutting of joints shall be made as soon as possible after slab finishing as may be safely done without dislodging aggregate.
- D. Place construction joints perpendicular to the main reinforcement. Continue reinforcement across construction joints.
- E. Provide keyways at least 1-1/2" deep in construction joints in walls, slabs and between walls and footings.

3.4 INSTALLATION OF EMBEDDED ITEMS

- A. General: Set and build into work anchorage devices and other embedded items required for other work that is attached to, or supported by, cast-in-place concrete. Use setting drawings, diagrams, instructions and directions provided by suppliers of items to be attached thereto.
- B. Edge Forms and Screed Strips for Slabs: Set edge forms or bulkheads and intermediate screed strips for slabs to obtain required elevations and contours in finished slab surface. Provide and secure units sufficiently strong to support types of screed strips by use of strike-off templates or accepted compacting type screeds.
- C. Dovetail Slots: Install dovetail slots vertically for anchoring masonry facing. Build dovetail slots into forms for embedment in concrete that is to be faced or abutted with another material. Space vertically at 24" for beams and walls. Install slots on vertical surfaces over 16" high to be faced. Provide vertical slot in concrete wall or column for each abutting masonry partition.

3.5 CONCRETE PLACEMENT

- A. Preplacement Inspection: Before placing concrete, inspect and complete the formwork installation, reinforcing steel and items to be embedded or cast-in. Notify other crafts to permit the installation of their work; cooperate with other trades in setting such work, as required. Clean all formwork of excess water and miscellaneous debris. Thoroughly wet wood form immediately before placing concrete as required where form coatings are not used.
- B. Coordinate the installation of joint materials and moisture barriers with placement of forms and reinforcing steel.
- C. General: Comply with ACI 304 and as herein specified.
- D. Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness within the section. If a section cannot be placed continuously, provide construction joints as herein specified. Deposit concrete as nearly as practicable to its final location to avoid segregation due to rehandling or flowing.
- E. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers not deeper than 24" and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.
- F. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spacing, rodding or tamping. Use equipment and procedures for consolidation of concrete in accordance with the recommended practices of ACI, to suit the type of concrete and project conditions.

- G. Do not use vibrators to transport concrete inside of forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than the visible effectiveness of the machine. Place vibrators to rapidly penetrate the placed layer of concrete and at least 6" into the preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion, limit the duration of vibration to the time necessary to consolidate the concrete and complete embedment of reinforcement and other embedded items without causing segregation of the mix.
- H. Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation, within the limits of construction joints, until the placing of a panel or section is completed.
- I. Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.
- J. Bring slab surfaces to the correct level with a straightedge and strikeoff. Use bull floats or darbies to smooth the surface, leaving it free of humps or hollows. Do not sprinkle water on the plastic surface. Do not disturb the slab surfaces prior to beginning finishing operations.
- K. Maintain reinforcing in the proper position during concrete placement operations.
- L. Cold Weather Placing: Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with ACI 306 and as herein specified. When air temperature has fallen to or is expected to fall below 40 degrees F, uniformly heat all water and aggregates before mixing as required to obtain a concrete mixture temperature of not less than 50 degrees F and not more than 80 degrees F at point of placement.
- M. Hot Weather Placing: When hot weather conditions exist that would seriously impair the quality and strength of concrete, place concrete in compliance with ACI 305 and as herein specified. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 degrees F. Mixing water may be chilled, or chopped ice may be used to control the concrete temperature provided the water equivalent of the ice is calculated to the total amount of mixing water. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that the steel temperature will not exceed the ambient air temperatures immediately before embedment in concrete. Wet forms thoroughly before placing concrete. Do not use retarding admixtures unless accepted in mix designs.

3.6 FINISH OF FORMED SURFACES

A. Rough Form Finish: For formed concrete surfaces not exposed- to-view in the finish work or by other construction unless otherwise indicated. This is the concrete surface having the texture imparted by the form facing material used, with tie holes and defective areas repaired and patched and fins and other projections exceeding 1/4" in height rubbed down or chipped off.

- B. Smooth Form Finish: For formed concrete surfaces exposed-to- view, or that are to be covered with a coating or covering material applied directly to the concrete, or a covering material applied directly to the concrete, such as waterproofing, damp proofing, painting or other similar system. This is the as-cast concrete surface as obtained with selected form facing material, arranged orderly and symmetrically with a minimum of seams. Repair and patch defective areas with all fins or other projections completely removed and smoothed.
- C. Related Unformed Surfaces: At top of walls, horizontal offsets and similar unformed surfaces occurring adjacent to formed surfaces, strike-off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise shown.

3.7 MONOLITHIC SLAB FINISHES

- A. General: Comply with recommendations in ACI 302.1R for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Float Finish: Apply float finish to monolithic slab surfaces that are to receive trowel finish and other finishes as hereinafter specified and slab surfaces which are to be covered with membrane or elastic waterproofing, membrane or elastic roofing, or sand-bed terrazzo and as otherwise indicated.
 - 1. After screeding and consolidating and leveling concrete slabs, do not work surface until ready for floating. Begin floating using float blades or float shoes only when surface water has disappeared or when concrete has stiffened sufficiently to permit operation of power driven floats, or both. Consolidate surface with power- driven floats, or by hand-floating if area is small or inaccessible to power units. Cut down high spots and fill low spots. Uniformly slope surfaces to drain, if applicable. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.
- C. Trowel Finish: Apply trowel to monolithic slab surfaces to be exposed-to-view, and slab surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile, paint or other thin film finish coating system.
 - 1. After floating begin first trowel finish operation using a power-driven trowel. Begin final trowelling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance.
- D. Trowel and Fine Broom Finish: Where ceramic or stone is to be installed with thin-set mortar, apply trowel finish as specified, then immediately follow with slightly scarifying surface by fine brooming.

- E. Non-Slip Broom Finish: Apply non-slip broom finish to exterior concrete platforms, steps and ramps and elsewhere as indicated. Immediately after trowel finishing, slightly roughen concrete surface by brooming with fiber bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.
- F. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- G. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates of manufacturer furnishing machines and equipment.
- H. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel-finish concrete surfaces.

3.8 FLOOR SLAB TOLERANCE

A. Floor Slab Tolerance: measured within 48 hours according to ASTM E 1155/E 1155M for a randomly trafficked floor surface. After final troweling operation, slabs shall have a surface flatness (Fr) / levelness (Fi) tolerance conforming to 25 / 20 minimum overall for composite of all measured values and 18 / 13 for any individual floor section. Unshored elevated slabs shall conform to Fr 20 for any individual floor section.

3.9 CONCRETE CURING AND PROTECTION

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperature and maintain without drying at a relatively constant temperature for a period of time necessary for hydration of cement and proper hardening. Start curing as soon as free water has disappeared from concrete surface after placing and finishing. Continue curing for at least 7 days in accordance with ACI 301 procedures. Avoid rapid drying at end of curing period.
- B. Curing shall be by application of the specified membrane-forming curing and sealing compound, the specified dissipating resin curing compound or by application of waterproof sheet materials conforming to ASTM C 171-80.
- C. Liquid membrane-forming curing and sealing compounds shall be applied in accordance with the manufacturer's recommendations. Interior slabs with resilient tile, carpet or left exposed and all exterior slabs, sidewalks, curbs, etc. shall be cured with the specified membrane-forming curing and sealing compound.
- D. Any membrane-forming curing and sealing compound used in floor slabs receiving applied finish flooring shall be guaranteed by the manufacturer, in writing, not to impair bonding of adhesive.

- E. For slabs, which are to receive terrazzo, bonded cementitious materials, epoxy or urethane coatings, liquid floor hardener, or waterproofing, use a curing treatment of moisture-retaining covers or the specified dissipating resin curing compound.
- F. The curing compounds must be applied immediately after final finishing. For curing by the waterproof sheet material, the concrete must be continually moist-cured for a minimum of 7 days. The curing process must begin immediately after final finishing.
- G. Provide Moisture-Cover Curing As Follows: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3" and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
- H. Provide Membrane Curing to Slabs As Follows: Apply membrane-forming curing and sealing compound or dissipating resin curing compound to concrete surfaces within 2 hours of final finishing operations. Apply uniformly in continuous operation by power-spray or roller in accordance with manufacturer's directions. Recoat areas which are subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.
- I. Curing Formed Surfaces: Cure formed concrete surfaces, including undersides of beams, supported slabs and other similar surfaces by moist curing with forms in place for full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.
- J. Sealer and Dustproofer: Apply a second coat of specified membrane-forming curing and sealing compound only to surface indicated to receive sealer-dustproofer finish.

3.10 SHORES AND RESHORES

- A. Comply with reshores ACI 318, ACI 347R ACI 301 and recommendations for shoring and reshoring in multistory construction, and as herein specified.
- B. Extend shoring from ground to roof for structures 4 stories or less, unless otherwise permitted.
- C. Extend shoring at least 4 floors under floor or roof being placed for structures over 4 stories. Shore floor directly under floor or roof being placed, so that loads from construction above will transfer directly to these shores. Space shoring in stories below this level in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members where no reinforcing steel is provided. Extend shores beyond minimums to ensure proper distribution of loads throughout structure.
- D. Remove shores and reshore in a planned sequence to avoid damage to partially cured concrete. Locate and provide adequate reshoring to safely support work without excessive stress or deflection.

E. Keep reshores in place a minimum of 15 days after placing upper tier, and longer if required, until concrete has attained its required 28-day strength and heavy loads due to construction operations have been removed.

3.11 REMOVAL OF FORMS

- A. Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50 degrees F for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form removal operations, and provide curing and protection operations are maintained.
- B. Formwork supporting weight of concrete, such as beam soffits, joists, slabs, and other structural elements may not be removed in less than 7 days and then only if reshores are employed. Reshore simultaneously with stripping to distribute construction loads safely to three or more floors below, or to ground. Perform reshoring to permit early form removal so that at no time will large areas of new construction be required to support its own weight. All reshores under cantilever slabs or beam construction to remain in place at least 28 days after concrete is poured. Determine potential compressive strength of inplace concrete by testing field-cured specimens representative of concrete location of members.

3.12 MISCELLANEOUS

- A. Filling-In: Fill in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place and cure concrete as herein specified, to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates of manufacturer furnishing machines and equipment.
- D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel-finish concrete surfaces.

3.13 CONCRETE SURFACE REPAIRS

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

- B. Cut out honeycomb, rock pockets, voids over 1/2" in any dimension, and holes left by tie rods and bolts, down to solid concrete but in no case to a depth of less than 1". Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water and brush-coat the area to be patched with specified bonding agent. Place patching mortar after bonding compound has dried.
- C. Repair of Formed Surfaces: Remove and replace concrete having defective surfaces if defect cannot be repaired to satisfaction of Architect. Surface defects as such include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets; fins and other projections on surface; and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes, fill with dry pack mortar.
- D. Repair of Unformed Surfaces: Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface plane to tolerances specified for each surface and finish.
- E. Repair defective area, except random cracks and single holes not exceeding 1" diameter, by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts and expose reinforcing steel with at least 3/4" clearance all around. Dampen concrete surfaces in concrete with patching concrete and apply bonding compound. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
- F. Repair isolated random cracks and single holes not over 1" in diameter by dry-pack method. Groove top of cracks and cut out holes to sound concrete and clean of dust, dirt and loose particles. Dampen cleaned concrete surfaces and apply bonding compound. Mix dry-pack, consisting of one part Portland cement to 2-1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing. Place dry pack after bonding compound has dried. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched area continuously moist for not less than 72 hours.

PART 4 - QUALITY CONTROL

4.1 TESTING DURING CONSTRUCTION

- A. The Owner will employ a testing laboratory to perform tests and to submit test results.
- B. Sampling and testing for quality control during placement of concrete shall include the following.
 - 1. Sampling Fresh Concrete: ASTM C172, except modified for slump to comply with ASTM C94.
 - 2. Slump: ASTM C143; up to one test for each concrete load at point of discharge; and one test for each set of compressive strength test specimens.

- 3. Air Content: ASTM C173, volumetric method for lightweight or normal weight concrete; ASTM C231 pressure for normal weight concrete; one for each set of compressive strength test specimens.
- 4. Concrete Temperature: Test hourly when air temperature is 40 degrees F and below, and when 80 degrees F and above; and each time a set of compression test specimens made.
- 5. Compression Test Specimen: ASTM C31, one set of 6 standard cylinders for each strength test, minimum.
- 6. Compressive Strength Tests: ASTM C39, one set for each [75 or 100] cu. yds. or fraction thereof, of each concrete class placed in any one day or for each 5,000 sq. ft. of surface area placed.

			i or surrado area placea.					
7.	x 12	8.	x 8					
	Cylinders		Cylinders					
9.	@ 7	10.	@ 7					
	days		days					
11.	@ 28	12.	@ 28					
	days		days					
13	. @ 56	14.	@ 56					
	days		days					
	(reserve)		(reserve*					
)					
15	. Additional	Additional as required for early						
	stripping b	stripping by the Contractor.						

- C. *Reserve denotes only break cylinders in the event that the 28 day test does not reach the required design strength.
- D. Test Results will be reported in writing to Architect, Structural Engineer and Contractor within three working days that tests are made. Reports of compressive strength tests shall contain the project identification, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials; compressive breaking strength and type of break for both 7-day and 28day tests.
- E. Additional Tests: The testing service will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by Architect. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42, or by other methods as directed. Contractor shall pay for such tests conducted, any other additional testing as may be required, and extra engineering and architectural services related to evaluating the problem and developing an acceptable solution.
- F. The contractor shall be responsible for scheduling with the testing laboratory, and shall provide free access for its personnel and labor required in helping to obtain and handle samples of concrete.

END OF SECTION 033000

SECTION 033053 - INTEGRALLY COLORED ARCHITECTURAL CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Integrally colored cast-in-place concrete.

1.2 REFERENCES

- A. American Concrete Institute:
 - 1. ACI 301 Structural Concrete for Buildings.
 - 2. ACI 305 Hot Weather Concreting.
 - 3. ACI 306 Cold Weather Concreting.
- B. American Society for Testing and Materials:
 - 1. ASTM C309 Liquid Membrane-Forming Compounds for Curing Concrete.
 - 2. ASTM C979 Pigments for Integrally Colored Concrete.

1.3 SUBMITTALS

- A. Submit product data and manufacturer's instructions for:
 - 1. Color additives.
 - 2. Curing compounds.
 - 3. Form facing materials.
 - 4. Form release agents.
 - 5. Proprietary cleaning agents.
 - 6. Surface retarders.
- B. B. Samples:
 - 1. Samples for Color Verification:
 - a. Submit sample chip of specified color indicating color additive number and required dosage rate[s]. Samples indicate general color and may vary from concrete finished in field according to Specifications.-

1.4 QUALITY ASSURANCE

- A. Perform work in accordance with ACI 301, Section 6 Architectural Concrete.
- B. Conform to ACI 305 during hot weather.

INTEGRALLY COLORED ARCHITECTURAL CAST-IN-PLACE CONCRETE

- C. Conform to ACI 306 during cold weather.
- D. Obtain each material from same source and maintain high degree of consistency in workmanship throughout Project.
- E. Installer Qualifications: Concrete work shall be by firm with five years experience with work of similar scope and quality.
- F. Colored Concrete Mock-Up:
 - 1. Provide full-scale mock-up of wall at least 60" in length. Construct at least one month before start of other concrete work to allow concrete to cure before observation.
 - 2. At location on Project selected by Landscape Architect, demonstrate methods of obtaining consistent visual appearance, including each forming and finishing condition required on Project using materials, workmanship, joint treatment, form ties, curing method, and patching techniques to be used throughout Project.
 - 3. Retain samples of cements, sands, aggregates, and color additives used in mock-up for comparison with materials used in remaining Work.
 - 4. Accepted mock-up provides visual standard for work of Section.
 - 5. Mock-up may remain as part of Work.

1.5 DELIVERY, STORAGE AND HANDLING

A. Color Additives: Comply with manufacturer's instructions. Deliver color additives to job site or batch plant in original, unopened packaging. Store in dry conditions.

1.6 PROJECT CONDITIONS

A. Schedule delivery of concrete to provide consistent mix times from batching until discharge.

PART 2 - PRODUCTS

2.1 CONCRETE MATERIALS

- A. Colored Additives for Integrally Colored Concrete:
 - 1. Manufacturer:
 - a. Davis Colors manufactured by Davis Colors; phone 800-356-4848, internet www.daviscolors.com, or e-mail info@daviscolors.com.
 - b. Substitutions: Not allowed.
 - 2. Materials:

- a. Colored additives shall contain pure, concentrated mineral pigments specially processed for mixing into concrete and complying with ASTM C979.
- b. Color additives containing carbon black are not acceptable.
- 3. Packaging: If color additives are to be added to mix at site, furnish color additives in premeasured Mix-Ready® disintegrating bags to minimize job site waste.
- B. Admixtures: Do not use calcium chloride admixtures.

2.2 FORMS

- A. Form Facing Material:
 - 1. Provide non-porous surface such as steel, plastic, or high-density overlaid plywood with watertight joint seals to prevent leakage.
- B. Form Ties: Fiberglass rods tinted to match concrete.
- C. Form Release: agent shall be non-staining and minimize formation of "bug-holes" in surface of concrete.

2.3 ACCESSORIES

- A. Curing Compound for Colored Concrete: Curing compound shall comply with ASTM C309 and be approved by color additive manufacturer for use with colored concrete. Provide W-1000 Clear Cure & Seal manufactured by Davis Colors.
- B. Sealants: Joint sealers shall be type specified in Section 079200. Provide in color to match colored concrete.
- C. Supports for Reinforcing Bars: Use corrosion-resistant types at locations in contact with exposed surfaces.
- D. Cleaning Agents: Use products known to be compatible with colored concrete.
- 2.4 2.04 MIXES
 - A. Color Additives: Mix in accordance with manufacturer's instructions. Mix until color additives are uniformly dispersed throughout mixture and disintegrating bags, if used, have disintegrated.
 - B. Do not retemper mix by adding water in field.

2.5 CONCRETE COLORS

- A. Concrete Color[s]: Match colors selected by Landscape Architect from color additive manufacturer's standard color line[s].
- B. Dosage rate of color additive shall not exceed 10 percent of weight of cementitious materials in mix.

PART 3 - EXECUTION

3.1 FINISHES ON FORMED SURFACES

- A. Provide the following finishes in accordance with ACI 301:
 1. As-cast, smooth form finish, smooth rubbed.
- B. Stripping: Leave forms in place as long as practical. Remove forms when concrete has reached a consistent age to maintain uniformity of curing conditions throughout Project.

3.2 CURING

- A. Maintain concrete between 65° and 85°F (18° to 29°C) during curing.
- B. Colored Concrete: Apply curing compound in accordance with manufacturer's instructions. Apply curing compound at consistent time for each pour to maintain close color consistency.

3.3 TOLERANCES

A. Minor variations in appearance of colored concrete, which are similar to natural variations in color and appearance of uncolored concrete, are acceptable.

3.4 3.06 CLEANING

- A. Efflorescence: Remove efflorescence as soon as practical after it appears.
- B. Use least aggressive cleaning techniques possible
- C. Wear protective eye wear, gloves, and clothing suitable to work and as required by cleaner manufacturer.
- D. If proprietary cleaning agents are used, pre-wet wall, test cleaning agent on a small, inconspicuous area, and check effects prior to proceeding. Begin cleaning at the top and work down. Thoroughly rinse wall afterwards with clean water. Follow cleaner manufacturer's instructions.

E. Do not use muriatic (hydrochloric) acid on colored concrete. END OF SECTION

SECTION 033543 - POLISHED CONCRETE 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 polished concrete finishing, including staining.
 - 1. Concrete for polished concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, initial finishing, and curing is specified in Section 033000 "Cast-in-Place Concrete."

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 ACTION SUBMITTALS

A. Samples for Initial Selection: For each type of product requiring color selection.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Material Certificates: For each of the following, signed by manufacturers:
 - 1. Liquid floor treatments.

1.6 QUALITY ASSURANCE

- A. Field Sample Panels: After approval of verification sample and before casting concrete, produce field sample panels to demonstrate the approved range of selections made under Sample submittals. Produce a minimum of three sets of full-scale panels, approximately 48 by 48 inches minimum, to demonstrate the expected range of finish, color, and appearance variations.
 - 1. Locate panels as indicated or, if not indicated, as directed by Architect.

POLISHED CONCRETE FINISHING

- 2. Maintain field sample panels during construction in an undisturbed condition as a standard for judging the completed Work.
- B. Mockups: Before casting concrete, build mockups to verify selections made under Sample submittals and to demonstrate typical joints, surface finish, tolerances, and standard of workmanship. Build mockups to comply with the following requirements, using materials indicated for the completed Work:
 - 1. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 FIELD CONDITIONS

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

PART 2 - PRODUCTS

2.1 LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatments for Polished Concrete Finish: Clear, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; that penetrates, hardens, and is suitable for polished concrete surfaces.

PART 3 - EXECUTION

3.1 POLISHING

- A. Polish: Level 2: Low sheen, 400 grit.
- B. Apply polished concrete finish system to cured and prepared slabs to match accepted mockup.
 - 1. Continue polishing with progressively finer-grit diamond polishing pads to gloss level, to match approved mockup.
 - 2. Control and dispose of waste products produced by grinding and polishing operations.
 - 3. Neutralize and clean polished floor surfaces.

END OF SECTION 033543

SECTION 035413 - 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 self-leveling, gypsum cement underlayment for application below interior floor coverings.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include plans indicating substrates, locations, and average depths of underlayment based on survey of substrate conditions.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Installer who is approved by manufacturer for application of underlayment products required for this Project.

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.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. 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.
- B. 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 GYPSUM CEMENT UNDERLAYMENTS

- A. Gypsum Cement Underlayment: Self-leveling, gypsum cement product that can be applied in minimum uniform thickness of 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Allied Custom Gypsum Plasterworks, LLC; AccuCrete.
 - b. ARDEX Americas; Ardex GS-4.
 - c. United States Gypsum Company; Levelrock 2500 Floor Underlayment.
 - 2. Cement Binder: Gypsum or blended gypsum cement as defined by ASTM C 219.
 - 3. Compressive Strength: Not less than 2500 psi at 28 days when tested according to ASTM C 109/C 109M.
- B. Water: Potable and at a temperature of not more than 70 deg F.
- C. Reinforcement: For underlayment applied to wood substrates, provide galvanized metal lath or other corrosion-resistant reinforcement recommended in writing by underlayment manufacturer.
- D. Primer: Product of underlayment manufacturer recommended in writing for substrate, conditions, and application indicated.
- E. Surface Sealer: Designed to reduce porosity as recommended by manufacturer for type of floor covering to be applied to underlayment.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for conditions affecting performance of the Work.
- 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. Concrete Substrates: Mechanically remove, according to manufacturer's written instructions, laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants that might impair underlayment bond.
- C. 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. Install underlayment reinforcement recommended in writing by manufacturer.
- D. Adhesion Tests: After substrate preparation, test substrate for adhesion with underlayment according to manufacturer's written instructions.

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.
- 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.

GYPSUM CEMENT UNDERLAYMENT

- 2. Feather edges to match adjacent floor elevations.
- D. Cure underlayment according to manufacturer's written instructions. Prevent contamination during application and curing processes.
- E. Do not install floor coverings over underlayment until after time period recommended in writing by underlayment manufacturer.
- F. Apply surface sealer at rate recommended by manufacturer.
- G. Remove and replace underlayment areas that evidence lack of bond with substrate, including areas that emit a "hollow" sound when tapped.
- 3.4 PROTECTION

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

END OF SECTION 03541

SECTION 036200 - NONSHRINK GROUT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General Conditions and other Division 1 Specification Sections, apply to the work of this Section.

1.2 DESCRIPTION

A. This specification describes nonshrink cement-based grout to be used wherever shown or implied on the drawings or called for in the specifications.

PART 2 - PRODUCTS

2.1 GENERAL

A. Nonshrink grout shall consist of premeasured, prepackaged materials supplied by the manufacturer requiring only the addition of water. The manufacturer's instructions must be printed on the outside of each bag.

2.2 NONSHRINK CEMENT-BASED GROUT

- A. The contractor shall submit information verifying that the grout exhibits the following:
 - 1. Nonshrink: No shrinkage (0.0%) and a maximum 4.0% expansion when tested in accordance with ASTM C-827. No shrinkage (0.0%), and a maximum of 0.2% expansion in the hardened state when tested in accordance with CRD-C-621.
 - 2. Compressive Strength: A minimum 28 day compressive strength of 5,000 psi when tested in accordance with ASTM C-109.
 - 3. Setting Time: A minimum set time of 60 minutes when tested in accordance with ASTM C-191.
 - 4. Technical Service: The manufacturer shall provide technical service upon request.
 - 5. Composition: For column base plates, grout containing metallic particles such as aluminum powders or iron fillings may be used. For any other applications, the grout shall not contain metallic particles or expansive cement.

2.3 WATER

A. Potable water shall be used in mixing grout. Use the minimum water necessary for proper installation in accordance with flowability requirements and manufacturers recommendations for specific applications.

PART 3 - EXECUTION

3.1 GENERAL

- A. Placing: The Contractor shall perform all mixing, grouting, and curing in accordance with the manufacturer's recommendations.
- B. Temperature: The temperature of the grouting surfaces and the grout shall be maintained between 50 degrees F and 90 degrees F during grouting and for a minimum of 24 hours thereafter.
- C. Elimination of Voids: Grout placement shall proceed in a manner that will assure the filling of all spaces and intimate contact of the grout with contact surfaces. Grout holes shall be used; location to be approved by Owner's Representative if not otherwise detailed.

3.2 SURFACE PREPARATION

- A. Concrete Surfaces:
 - 1. The concrete on which the grout will bear shall have attained its design strength before grouting.
 - 2. Concrete shall be sound and all surfaces to be in contact with the grout shall be entirely free of oil, grease, laitance, curing compounds, and other deleterious substances.
 - 3. Surfaces shall be roughened by chipping, sandblasting or other mechanical means to assure bond of the grout to the existing concrete.
 - 4. Concrete surfaces shall be washed clean, then saturated with water for 24 hours prior to placement of cement-based grout. Excess water must be removed prior to grouting.
- B. Metal Surfaces: All metal surfaces which are to be in direct contact with the grout shall be thoroughly cleaned to bare metal immediately before grouting.

3.3 GROUT REMOVAL

A. Treat adjacent surfaces and formwork with a bond breaking material to prevent bonding of excess grout.

END OF SECTION 036200

SECTION 042000 - UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Concrete masonry units.
 - 2. Splitface concrete masonry units.

1.2 ALLOWANCES

A. Face brick is part of the Face Brick Allowance.

1.3 DEFINITIONS

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

1.4 FIELD CONDITIONS

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

PART 2 - PRODUCTS

2.1 UNIT MASONRY, GENERAL

- A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6, except as modified by requirements in the Contract Documents.
- B. Masonry to conform to the following specifications:

1.	Hollow Load Bearing C.M.U:	ASTM C90
2.	Concrete Building Brick:	ASTM C55, Grade A
3.	Mortar:	ASTM C270, Type M or S
4.	Grout:	ASTM C476

UNIT MASONRY

- C. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work and will be within 20 feet vertically and horizontally of a walking surface.
- D. Fire-Resistance Ratings: Comply with requirements for fire-resistance-rated assembly designs indicated.
 - 1. Where fire-resistance-rated construction is indicated, units shall be listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction.

2.2 CONCRETE MASONRY UNITS

- A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated
 - 1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
- B. CMUs: See structural drawings for more information
- C. Splitface CMU (Trash Compactor Enclosure)
 - 1. Provide even mix of two colors as selected by Architect from manufacturer's full range.
- PART 3 -

PART 4 - INSTALLATION, GENERAL

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

4.2 TOLERANCES

A. Dimensions and Locations of Elements:

UNIT MASONRY

- 1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch or minus 1/4 inch.
- 2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch.
- 3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.
- B. Lines and Levels:
 - 1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet, or 1/2-inch maximum.
 - 2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
 - 3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
 - 4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
 - 5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
- C. Joints:
 - 1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
 - 2. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
 - 3. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch.

4.3 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.
- C. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- D. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.
- E. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

4.4 MORTAR BEDDING AND JOINTING

- A. Lay as follows:
 - 1. Bed face shells in mortar and make head joints of depth equal to bed joints.
 - 2. Bed webs in mortar in all courses of piers, columns, and pilasters.
 - 3. Bed webs in mortar in grouted masonry, including starting course on footings.
 - 4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.
- B. Lay solid masonry units and hollow brick with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- C. Lay structural clay tile as follows:
 - 1. Lay vertical-cell units with full head joints unless otherwise indicated. Provide bed joints with full mortar coverage on face shells and webs.
 - 2. Lay horizontal-cell units with full bed joints unless otherwise indicated. Keep drainage channels, if any, free of mortar. Form head joints with sufficient mortar so excess will be squeezed out as units are placed in position. Butter both sides of units to be placed, or butter one side of unit already in place and one side of unit to be placed.
 - 3. Maintain joint thicknesses indicated except for minor variations required to maintain bond alignment. If not indicated, lay walls with 1/4- to 3/8-inch-thick joints.
- D. Rake out mortar joints at to a uniform depth of 1/4 inch and point with epoxy mortar to comply with epoxy-mortar manufacturer's written instructions.
- E. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
- F. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

4.5 COMPOSITE MASONRY

- A. Bond wythes of composite masonry together using one of the following methods:
 - 1. Individual Metal Ties: Provide ties as shown installed in horizontal joints, but not less than one metal tie for 2.67 sq. ft. of wall area spaced not to exceed 16 inches o.c. horizontally and 16 inches o.c. vertically. Stagger ties in alternate courses. Provide additional ties within 12 inches of openings and space not more than 36 inches apart around perimeter of openings. At intersecting and abutting walls, provide ties at no more than 24 inches o.c. vertically.
 - 2. Masonry-Joint Reinforcement: Installed in horizontal mortar joints.
 - a. Where bed joints of both wythes align, use ladder-type reinforcement extending across both wythes.
- Where bed joints of wythes do not align, use adjustable-type (two-piece-type) reinforcement with continuous horizontal wire in facing wythe attached to ties.
- B. Collar Joints: Solidly fill collar joints by parging face of first wythe that is laid and shoving units of other wythe into place.
- C. Corners: Provide interlocking masonry unit bond in each wythe and course at corners unless otherwise indicated.
- D. Intersecting and Abutting Walls: Unless vertical expansion or control joints are shown at juncture, bond walls together as follows:
 - 1. Provide individual metal ties not more than 8 inches o.c.
 - 2. Provide continuity with masonry-joint reinforcement by using prefabricated T-shaped units.
 - 3. Provide rigid metal anchors not more than 24 inches o.c. If used with hollow masonry units, embed ends in mortar-filled cores.

4.6 CAVITY WALLS

- A. Bond wythes of cavity walls together using one of the following methods:
 - 1. Individual Metal Ties: Provide ties as shown installed in horizontal joints, but not less than one metal tie for 2.67 sq. ft. of wall area spaced not to exceed 16 inches o.c. horizontally and 16 inches o.c. vertically. Stagger ties in alternate courses. Provide additional ties within 12 inches of openings and space not more than 36 inches apart around perimeter of openings. At intersecting and abutting walls, provide ties at no more than 24 inches o.c. vertically.
 - 2. Masonry-Joint Reinforcement: Installed in horizontal mortar joints.
 - a. Where bed joints of both wythes align, use ladder-type reinforcement extending across both wythes.
 - Where bed joints of wythes do not align, use adjustable-type (two-piece-type) reinforcement with continuous horizontal wire in facing wythe attached to ties.
 - c. Where one wythe is of clay masonry and the other of concrete masonry, use adjustable-type (two-piece-type) reinforcement with continuous horizontal wire in facing wythe attached to ties to allow for differential movement regardless of whether bed joints align.
- B. Keep cavities clean of mortar droppings and other materials during construction. Bevel beds away from cavity, to minimize mortar protrusions into cavity. Do not attempt to trowel or remove mortar fins protruding into cavity.
- C. Parge cavity face of backup wythe in a single coat approximately 3/8 inch thick. Trowel face of parge coat smooth.

D. Installing Cavity Wall Insulation: Place small dabs of adhesive, spaced approximately 12 inches o.c. both ways, on inside face of insulation boards, or attach with plastic fasteners designed for this purpose. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways. Press units firmly against inside wythe of masonry or other construction as shown.

4.7 ANCHORED MASONRY VENEERS

- A. Anchor masonry veneers to wall framing or concrete and masonry backup with masonry-veneer anchors to comply with the following requirements:
 - 1. Fasten screw-attached seismic anchors through sheathing to wall framing or to concrete and masonry backup with metal fasteners of type indicated. Use two fasteners unless anchor design only uses one fastener.
 - 2. Embed tie sections in masonry joints.
 - 3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
 - 4. Space anchors as indicated, but not more than 18 inches o.c. vertically and 24 inches o.c. horizontally, with not less than one anchor for each 2 sq. ft. of wall area. Install additional anchors within 12 inches of openings and at intervals, not exceeding 8 inches, around perimeter.

4.8 MASONRY-JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.
 - 1. Space reinforcement not more than 16 inches o.c.
 - 2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
 - 3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings in addition to continuous reinforcement.
- B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.
- C. Provide continuity at wall intersections by using prefabricated T-shaped units.
- D. Provide continuity at corners by using prefabricated L-shaped units.
- 4.9 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE
 - A. Anchor masonry to structural steel and concrete, where masonry abuts or faces structural steel or concrete, to comply with the following:

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

4.10 FLASHING, WEEP HOLES, AND CAVITY VENTS

- A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated. Install cavity vents at shelf angles, ledges, and other obstructions to upward flow of air in cavities, and where indicated.
- B. Install flashing as follows unless otherwise indicated:
 - 1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
 - 2. At multiwythe masonry walls, including cavity walls, extend flashing through outer wythe, turned up a minimum of 8 inches, and through inner wythe to within 1/2 inch of the interior face of wall in exposed masonry. Where interior face of wall is to receive furring or framing, carry flashing completely through inner wythe and turn flashing up approximately 2 inches on interior face.
 - 3. At lintels and shelf angles, extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.
 - 4. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall, and adhere flexible flashing to top of metal drip edge.
 - 5. Install metal flashing termination beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall, and adhere flexible flashing to top of metal flashing termination.
- C. Install weep holes in exterior wythes and veneers in head joints of first course of masonry immediately above embedded flashing.
 - 1. Use specified weep/cavity vent products to form weep holes.
 - 2. Space weep holes 24 inches o.c. unless otherwise indicated.
 - 3. Cover cavity side of weep holes with plastic insect screening at cavities insulated with loose-fill insulation.
- D. Place cavity drainage material in airspace behind veneers to comply with configuration requirements for cavity drainage material in "Miscellaneous Masonry Accessories" Article.
- E. Install cavity vents in head joints in exterior wythes at spacing indicated. Use specified weep/cavity vent products to form cavity vents.

UNIT MASONRY

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

4.11 REINFORCED UNIT MASONRY INSTALLATION

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

4.12 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.
- B. Inspections: Special inspections according to Level A in TMS 402/ACI 530/ASCE 5.
 - 1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
 - 2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
 - 3. Place grout only after inspectors have verified proportions of site-prepared grout.
- C. Testing Prior to Construction: One set of tests.
- D. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.
- E. Clay Masonry Unit Test: For each type of unit provided, according to ASTM C 67 for compressive strength.

- F. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.
- G. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.
- H. Mortar Test (Property Specification): For each mix provided, according to ASTM C 780. Test mortar for compressive strength.
- I. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.

4.13 PARGING

- A. Parge exterior faces of below-grade masonry walls, where indicated, in two uniform coats to a total thickness of 3/4 inch. Dampen wall before applying first coat, and scarify first coat to ensure full bond to subsequent coat.
- B. Use a steel-trowel finish to produce a smooth, flat, dense surface with a maximum surface variation of 1/8 inch per foot. Form a wash at top of parging and a cove at bottom.
- C. Damp-cure parging for at least 24 hours and protect parging until cured.

4.14 REPAIRING, POINTING, AND CLEANING

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

4.15 MASONRY WASTE DISPOSAL

A. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.

- 1. Do not dispose of masonry waste as fill within 18 inches of finished grade.
- B. Masonry Waste Recycling: Return broken CMUs not used as fill to manufacturer for recycling.
- C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above or recycled, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 042000

SECTION 047300 - SIMULATED MASONRY (MANUFACTURED STONE VENEER AND TRIM)

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Manufactured Stone Veneer and Architectural Precast Trim products
 - 2. Manufactured Thin Brick Veneer and Architectural Precast Trim products

1.2 RELATED SECTIONS

- A. Drawings and General Provisions of the Contract, including General and Supplementary Condition and Division 1 Specification Sections, apply to this Section.
- B. Section 033000 Cast-In-Place Concrete
- C. Section 042000 Masonry Units
- D. Section 047100 Thin Brick Masonry Veneer
- E. Section 054000 Cold-Formed Metal Framing
- F. Section 061000 Rough Carpentry
- G. Section 061120 Framing and Sheathing
- H. Section 076200 Sheet Metal Flashing & Trim
- I. Section 079000 Joint Protection

1.3 REFERENCES

- A. ICC Evaluation Service International Code Council (ICC-ES); Birmingham, Alabama 800-423-6587
- B. American Society for Testing and Materials International (ASTM); Philadelphia, Pennsylvania. (215) 299-5420

Test Methods:

- 1. ICC-ES AC-51, Acceptance Criteria for Precast Stone Veneer
- 2. ASTM C67-03ae01, Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile
- 3. 1. ASTM C567-05a Standard Test Method for Determining Density of Structural Lightweight Concrete
- 4. ASTM C39-99ae1, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens

- 5. ASTM C192-81 Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory
- 6. ASTM C109/C109M-02 Standard Test Method for Compressive Strength of Hydraulic Cement Mortars
- 7. ASTM C190-85, Standard Test Method for Tensile Strength of Hydraulic Cement Mortars
- 8. ASTM C348-86, Standard Test Method for Flexural Strength of Hydraulic Cement Mortars
- 9. ASTM C482-02, Standard Test Method for Bond Strength of Ceramic Tile to Portland Cement Paste
- 10. ASTM C1670/C1670M-20a Standard Specification for Adhered Manufactured Stone Masonry Veneer Units
- C. Masonry Veneer Manufacturers Association (MVMA); Herndon, Virginia. (703) 713-1900
- 1.4 SUBMITTALS
 - A. Submit following submittals in accordance with Section 01300.
 - B. Product Data: For each variety of stone, stone accessory, and manufactured product. Manufacturer's specification and data sheets for each type of product indicated, Including:
 - C. Samples for Verification: For each stone type indicated, provide at least two Samples in each set and show the full range of color and other visual characteristics in completed Work.
 - 1. A 2'x2' approximate portable size sample board should be submitted for each product specification.
 - 2. Include manufacturer's color selection charts showing the full range of colors available for each stone veneer product exposed to view.
 - D. Shop Drawings: Provide detailed cut sheets of Manufactured Stone products and fastening methods to be used.
 - E. Manufacturer's Certificate: Certify that products meet those requirements set forth in the ICC ES Testing Requirements for Manufactured Stone Masonry, including all related product testing and building codes.
 - F. Closeout Submittals: Submit following items:
 - G. Maintenance Instructions
 - H. Storage and Handling Recommendations
 - I. Quality Stone Veneer Installation and Product Warranties

1.5 QUALITY ASSURANCE

- A. Qualifications: Company specializing in manufacturing and installing manufactured stone veneer.
- B. Single Source Accountability: Obtain manufactured stone, thin brick and/or trim precast from a single turnkey manufacturer & installer with no less than twenty-five years of documented experience in manufacturing and installation of materials depicted in this submittal. Manufacturer and installer shall have completed at minimum ten projects of similar scope.
 - 1. Quality Stone Veneer, Inc. Qualifications:
 - 2. Has been in business over 40 years, founded in 1976.
 - 3. Has 25 years' experience in the manufacturing of stone veneer.
 - 4. Provides an OSHA certified project field manager.
 - 5. Provides extensive company and jobsite safety programs including, but not limited to: scaffold safety, fall protection, personal protective equipment and an in house safety incentive program for all employees and subcontractors.
 - 6. Has a 50 year product warranty.
 - 7. Follows all updated guidelines set forth by the Masonry Veneer Manufacturer's Association.
 - 8. Services a national footprint across the United States.
- C. Installation Qualifications: Installer must have minimum 5 years' experience in the successful installation and completion of manufactured stone masonry work of similar scope to the given project. Installer must be able to provide a jobs and references if requested by project team or architect.
- D. Mockups: Build on-site mockup to demonstrate aesthetic effects and to set quality standards for materials and execution. Mock up to serve as final verification and approval on stone style, stone color, installation accessories, precast accessories and grout. Mockup can either be installed on a section of the project determined by the GC/Owner, or installed on a separate freestanding mock up structure provided by the GC/Owner.
 - 1. Build mockups for typical exterior wall in sizes approximately 48 inches long by 48 inches high by full thickness.
 - 2. Include manufactured stone sill, banding, and accessories as shown or required.
 - 3. Protect and retain sample as a basis for approval of completed manufactured stone work. Approved sample may be incorporated into completed work.
 - 4. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
- E. Product Testing Certifications: Quality Stone Veneer ICC-ES Evaluation Report.
- F. Preconstruction Meeting: Precon meeting to be held between Quality Stone Veneer local representative and project team to verify all items pertaining to the given scope of work including but not limited to: samples, application method, installation products, site conditions and schedule.
 - 1. Attendance: General Contractor, Architect/Owner's Representative, Quality Stone Veneer local representative
- G. Warranty: Single Source Warranty by Quality Stone Veneer, Inc.

- 1. Quality Stone Veneer, Inc. Fifty (50) Year Product Warranty
- 2. Quality Stone Veneer, Inc. Ten (10) Year Precast Accessory Warranty
- 3. Quality Stone Veneer, Inc. One (1) Year Installation Warranty

1.6 DELIVERY, STORAGE & HANDLING

- A. Delivery: Coordination of onsite delivery to be planned in advance between Quality Stone Veneer Shipping Department and on site project team to determine staging area and placement of materials in order to avoid work delays.
- B. Store and handle products in manufacturer's unopened packaging until ready for installation in order to prevent damage from moisture, temperature or outside forces.
- C. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

1.7 SITE CONDITIONS

- A. Cold Weather Requirements: Do not build on frozen substrates. Remove and replace units damaged by frost or freezing conditions. Installation only to be performed when air temperature is above 40 F for a minimum of 48 hours.
 - 1. During conditions where this temperature cannot be maintained, tenting with waterproof sheeting and heating is an approved method for stone installation whereby the air temperature can be maintained to allow for stone installation and curing, as recommended in section Ó2104.3 Cold Weather Construction•of the International Building Code.
- B. Hot Weather Requirements: When ambient temperature exceeds 100 F, or 90 F with a wind velocity greater than 8 mph, do not spread mortar beds more than 48 inches ahead of masonry. Set masonry units within one minute of spreading mortar.
- C. Follow all manufacturers' recommended environmental conditions to ensure proper installation and finish results.
 - 1. Protection of Stone Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work.
 - 2. Protect base of walls from rain-splashed mud and mortar splatter using coverings spread on the ground and over the wall surface.
 - 3. Protect sills, ledges, and projections from mortar droppings.
 - 4. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 - 5. Turn scaffold boards near the wall on edge at end of each day to prevent rain from splashing mortar and dirt on completed stone masonry.

1.8 COORDINATION

A. Advise installers of other work about specific requirements for placement of flashing and similar items to be built into stone masonry. Coordinate stone veneer assemblies with rain drainage work, flashing, trim, and construction of studs, soffits, and other adjoining work to provide secure and water-tight installation.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Basis of Design Manufacturer: Quality Stone Veneer, Inc.

Corporate Office: 50 Refton Road, Refton, PA 17568 Phone: 717-786-3229 Fax: 717-806-0961 Email: Estimating@QualityStoneVeneer.com Web: QualityStoneVeneer.com

- B. Product: Style/Color as selected by the Architect/Owner
 - 1. Source Limitations for Stone: Obtain each variety of stone, regardless of finish, from single manufacturer, whether specified in this Section or in another Section of the Specifications, with resources to provide materials of consistent quality in appearance and physical properties.
- C. Basic Use
 - 1. Interior or exterior walls of new construction.
 - 2. Remodeling and redecorating of existing walls.
 - 3. Fireplaces: around openings, hearth, exterior chimney finish, or chase finish.
- D. Substitutions: Not Permitted.

2.2 STONE VENEER

- A. Manufactured Stone Veneer:
 - 1. Color/Profile: OHIO DRYSTACK STYLE. COLOR TBD
- B. Precast Stone Accessories
 - 1. Hewn Window Lilntel: Sand
 - 2. Hewn Window Sill: Sand
- C. Mortar
 - 1. Color/Joint Style: TBD

2.3 PROPERTIES

- A. Veneer Unit Properties: Manufactured stone veneer units and accent pieces consisting of Portland cement, lightweight aggregates, and mineral oxide pigments.
 - 1. Compressive Strength: ASTM C 192, not less than 1800 psi.
 - 2. Sheer Bond, Type S Mortar and Backing: ASTM C 482, min 50 psi.
 - 3. Freeze-Thaw: ASTM C 67, less than 3% weight loss
 - 4. Fire Hazard Test: UL Standards met, 0/0 Flame spread
 - 5. Maximum Veneer Unit Weight: 15 lbs. /square foot

- B. Quality Stone Veneer product is manufactured utilizing a mix of Portland cement, light weight aggregates, minerals, and powdered dyes. Quality Stone Veneer product is cast from natural stone profiles by hand in a wide variety of textures and styles to create a unique, natural finish.
- C. Note: Manufactured stone does not add strength to load-bearing capacity of wall. Stone should not be used in below-water applications. Product is intended for interior or exterior nonstructural lightweight veneer facing on masonry, metal, or frame construction for architectural beauty.

2.4 MORTAR

A. Mortar

- 1. Cement: Any cement complying with ASTM C270
- 2. Sand: AST C144, natural sand
- 3. Color: As selected by Architect and Owner
- 4. Water: Potable
- B. Admixtures
 - 1. Bonding Agent: Concrete Bonding Adhesive per ASTM C1059, formulated for permanently bonding new concrete or plaster to old concrete.
- C. Mortar should be mixed with the appropriate volume of sand and water, as per ASTM C270. Place approximately one-half the estimated amount of water into the mixer, followed by one-half of the sand, and all of the cement. Add balance of sand and gradually add remaining water to obtain the desired working consistency. Mix all material 3 to 5 minutes in a mechanical mixer.
- D. Pre-mix Mortar/Sand
 - 1. Premixed sand/mortar in a bagged product, with a contractor-grade polymer modified mortar designed for stone veneer applications
 - 2. Mix per manufacturer's recommendations.

2.5 RELATED MATERIALS

- A. Weather Resistive Barrier: ASTM D 779, Type 1, Grade ÓD, non-perforated asphalt saturated felt paper.
- B. Self-adhered Flashing: Grace Vycor, 25 mil, cold applied, self-adhering membrane consisting of a 3 mil polyethylene film coated on one side with a 22 mil layer of rubberized asphalt adhesive. Used for all openings in framed walls for completing a weather resistive barrier, including windows, doors, MEP penetrations, and as required per code.
- C. Ice and Water Shield: WIP 100 by Carlisle WIP products consisting of a 55-mil flexible rubberized asphalt, fiberglass-reinforced membrane used as an underlayment on critical concrete or masonry block areas before wire lath and stone installation. Such areas include masonry chimneys above rooflines, and areas of poured concrete or block walls where moisture drainage will be critical to minimize efflorescence.

D. Drip Cap: Minimum 26 Gauge Galvanized Metal drip flashing as needed,

description; in standard manufacturers'color selection.

- E. Weep Products: Use one of the following unless otherwise indicated over framed construction:
 - 1. Vinyl Foundation Weep Screed: manufactured with 3.5 nailing flange as
 - color selection.
 - 2. Metal Foundation Weep Screed: G60 Galvanized Weep Screed to ASTM A653 to a minimum of .0172 inch, manufactured with 3.5•nailing flange as required by
 - 3. Subject to compliance with code requirements, provide drip cap per 2.3.B above at designated weep areas and product indicated below by Masonry Technology Incorporated:
 - a.
 - b. Spacing at 12-centers on galvanized drip cap to form weep openings.
- F. Expanded Metal Lath: 2.5 lb. /sq. yd., self-furring, diamond-mesh lath complying with ASTM C 847. Fabricate from structural-quality, zinc-coated (galvanized) steel sheet complying with ASTM A 653/A 653M, G60.
- G. Cavity Drainage Materials
 - 1. Ventilated rainscreen: high density polyethylene sheet, dimpled and grooved to provide drainage and ventilation on both sides of sheet.
 - a. Product: Keene Driwall Rainscreen 10mm
 - Provide weep openings at head of windows, doors, and other openings using the following by Masonry Technology Incorporated: a.
 - b. Spacing at 12-centers on galvanized drip cap to form weep openings
 - 3. Casing Bead: E-Z Bead'Vinyl Casing Bead by Amico Industries with a built-in flexible strip for uniform spacing around window and door frames.
- H. Lath Attachment Devices: Material and type required by ASTM C 1063 for installations indicated.

2.6 TECHNICAL DATA

- A. Applicable standards: Professional Service Industries, Inc. Project No. 812-50301.
 - 1. Product thickness .15 ft.
 - 2. Density (lbs. per cu. ft.) 82.2
 - 3. Temperature hot side (F) 95 degrees
 - 4. Temperature cold side (F) 55 degrees
 - 5. Average mean temperature (F) 75 degrees
 - 6. Thermal conductivity (k) 1.569
 - 7. Thermal resistance (r) 1.148
 - 8. Absorption (24 hours) 15.1%
- B. Applicable standards: Underwriter's Laboratories, Inc. Project No. 05CA22150

SIMULATED MASONRY

- 1. (CFS) Calculated Flame Spread 0
- 2. (FSI) Flame Spread Index 0
- 3. (CSD) Calculated Smoke Developed 5.9
- 4. (SDI) Smoke Developed Index 5

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Installation is not to begin until all substrates have been properly prepared prior to stone installation, including necessary flashings, transitions, flatwork and penetrations in stone areas.
- B. Establish lines, levels, and coursing. Protect from disturbance.
- C. Commencement of work by installer is acceptance of substrate.
- D. Installation is not to occur where overhead work is taking place at any time.

3.2 PREPARATION FOR VENEER

- A. Install in accordance with Manufacturer's instructions, that being the most recent version of the Masonry Veneer Manufacturers Association (MVMA) Installation Guide found at www.masonryveneer.org.
- B. Install one layer of weather resistive barrier (WRB) over the wall system, flashing properly around windows, doors, and other penetrations with 6-self-adhered flashing.
- C. Verify that all items built in under other Sections are properly located and installed, including those set forth for stone veneer.
- D. Install lath per installation guide and over masonry backup to comply with ASTM C 1063.
- E. Apply a ½•thick scratch coat of mortar over the metal lath.

3.3 INSTALLATION

- A. Erect stone veneer in accordance with manufacturer's instructions at www.qualitystoneveneer.com.
- B. Adjust layout so that color variations between individual adjacent pieces are not visually distinct. When installing stone, achieve a balanced pattern of shapes and colors by mixing the various sizes and textures of stone, and mixing stones from different boxes throughout the installation.
- C.

space around the stones is desirable.

- D. Stones should be cut with a wiremouth nippers, brick hammer, or with a diamond saw blade. Cut edges should be turned so they are not visible and the edges are concealed with mortar when grouting.
- E. A mason's trowel should be used to apply a ½•thick even layer of mortar to the stone back, scraping against the raked back to ensure proper bonding to the wall. A second layer of mortar should be used to create a beveled mud bed at all stone edges, using the edge of the trowel to create this bed. The stone should be pressed firmly into place and then a gentle wiggling action to ensure a good bond. The mortar should squeeze out around the edges of the stone and allowed to set until dry and crumbly.
- F. After stones are set in the wall, the jointed should be raked out prior to jointing. A grout bag should be used to fill the joints with mortar forcing grout into any voids. The joints should be allowed to set until dry and crumbly, and then struck with a metal striking tool. After striking the joints, a whisk broom should be used to smooth the joints and clean away loose mortar from the joints and stone face.

3.4 FIELD QUALITY CONTROL

- A. Fabricator's Field Service: Engage a manufacturer-authorized field representative to test and inspect completed stone veneer panel installation, including accessories.
- B. Stone Veneer wall panels will be considered defective if they do not pass tests and inspections.
- C. Reference: ASTM C1670/C1670M-20a

3.5 CLEANING, MAINTENANCE AND PROTECTION

- A. Remove and replace stone masonry of the following description:
 - 1. Broken, chipped, stained, or otherwise damaged stone. Stone may be repaired if methods and results are approved by architect.
 - 2. Defective joints.
 - 3. Stone masonry not matching approved samples and mockups.
 - 4. Stone masonry not complying with other requirements indicated.
- B. B. Cleaning
 - 1. Most applications require no maintenance. The use of a high quality waterproofing sealer is recommended on any Quality Stone surface, but especially on those exposed to severe freezing or thawing, excessive moisture, or conditions which could discolor or stain the stone. A sealed surface is much easier to clean than an unsealed surface. We recommend that consumers have a sealant such as DECO 30 applied to Quality Stone Veneer.
 - 2. Applications where dirt or dust may accumulate can be washed occasionally using a garden hose and soft bristle brush. Do not use a wire brush. Use mild soap or detergent and water; rinse immediately with fresh water.
 - a. To clean dirt or other particles from the stone, use a granulated type detergent mixed with water and a soft bristle brush.

- b. Use nonmetallic tools in the cleaning operations; do not use pressure washing nor an acidic cleaner on the manufactured products as this may damage or discolor the stone.
- 3. Do not attempt to clean with acid or acid based products or Power Washer.
 - a. Efflorescence is normal and common in all masonry products and easily remedied. To remove, allow stone to dry. Scrub with stiff bristle brush and clean water. If efflorescence is still noticeable, scrub with solution of 50% household white vinegar and 50% water and rinse thoroughly.
- 4. Salt and Calcium Chloride Products: Do not use any of these products on areas adjacent to a stone veneer product.

END OF SECTION

SECTION 051200 - STRUCTURAL STEEL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION

- A. Extent of structural steel work is shown on drawings, including schedules, notes and details to show size and location of members, typical connections, and type of steel required.
- B. Section includes structural steel as defined by the AISC Code of Standard Practice.
- C. Products furnished but not installed under this section:
 - 1. Steel anchorages cast in concrete or installed in masonry.
 - 2. Loose lintels in masonry walls.
 - 3. Anchor bolts and leveling plates.
- D. General: Unless otherwise specifically approved in writing, furnish exact section, weights, and kinds of material specified, using details and dimensions shown.
- E. Details shown are typical; similar details apply to similar conditions, unless otherwise indicated.
- F. Substitution of other shapes of equivalent or greater strength and no greater dimension may be allowed by the Architect, but only under normal substitution procedures.

1.3 QUALITY ASSURANCE

- A. Welding Procedures: Establish that joint welding procedures are prequalified or test in accordance with AWS D1.1 qualification procedures.
- B. Welder Qualifications: Welders must be currently certified under American Welding Society qualification procedures. If recertification is required, retesting will be the Contractor's responsibility.
- C. Regulatory Requirements: Unless other requirements of governing authorities or particular requirements of this specification are more stringent, comply with provisions of the following:
 - 1. AISC "Code of Standard Practice for Steel Buildings and Bridges"

- 2. AISC "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design," with Commentary and Supplements
- 3. AISC œ Load and Resistance Factor Design (LRFD) Specification for Structural Steel Buildings•
- 4. ASTM A6 œSpecification for General Requirements for Rolled Steel Plate, Shapes, Sheet Piling and Bars for Structural Use•
- 5. Research Council on Structural Connections (RCSC) œ Specification for Structural Joints Using ASTM A325 or A490 Bolts•
- 6. ANSI/AWS D1.1, "Structural Welding Code Steel"
- ASTM A 123 -- Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products. CRD - C 621 -- Corps of Engineers Specification for Nonshrink Grout; U.S. Army Corps of Engineers.

1.4 SUBMITTALS

- A. Product Data: Submit producer's or manufacturer's data for products as follows, including sufficient data to show compliance with specified requirements:
 - 1. Structural steel primer
 - 2. Expansion bolts
 - 3. Headed Studs
 - 4. Slide bearing pads
- B. If requested, submit mill test reports for each type of structural steel furnished.
- C. If requested, submit mill test reports for high-strength bolts, nuts, and washers, including chemical analysis, tensile strength tests, and hardness tests.
- D. Shop Drawings: Submit complete shop drawings at 1/8 inch (1:100 mm) scale minimum for structural steel, including information on location, type, and size of all bolts, and welds, distinguishing between those made in the shop and those made in the field. (Reproduced contract drawings are not acceptable for use as erection plans.)
 - 1. Structural steel piece drawings shall denote the gravity load used to select the connection.
 - 2. Include cambers, splices, holes and other pertinent data.
 - 3. CAD files of the structural drawings are available for use by the contractor for a standard processing fee. If files are desired, contact Ehlert/Bryan, Inc. at 703-827-9552.
- E. Indicate weld lengths and sizes, using standard AWS welding symbols. Distinguish between shop and field welds.
- F. Include setting drawings and templates for anchorages to be installed as work of other sections.
- G. The Contractor shall verify all existing conditions and dimensions prior to submitting of shop drawings. Shop drawings shall not be submitted until all field checking of dimensions have been shown on the shop drawings.

- H. Test Reports: The owner's testing and inspection agency will submit test reports for all specified tests of connections.
- I. Welder Qualifications: Submit evidence that welders employed in the work are currently certified under AWS qualification procedures.
- J. Surveys: Submit copies of specified surveys, showing locations and elevations of all critical elements. Indicate discrepancies between field data and information shown on contract documents.

PART 2 - PRODUCTS

2.1 STEEL MATERIALS

- A. Metal Surfaces, General: For fabrication of work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, rust and scale seam marks, roller marks, rolled trade names and roughness. Remove such blemishes by grinding, or by welding and grinding, prior to cleaning, treating and application of surface finishes.
- B. Structural Steel Angles, Channels, Plates, and Bars: ASTM A 36.
- C. Structural Steel Wide Flange Shapes: High-Strength, Low-Alloy Columbium-Vanadium Steels: ASTM A 992, Grade 50.
- D. Cold-Formed Structural Tubing: ASTM A 500, Grade B.
- E. Steel Pipe: ASTM A 53. Type E or S, Grade B.
- F. Anchor Bolts: ASTM A 36
- G. Shear Connectors: Headed stud type, ASTM A 108, Grade 1010 through 1020, made from cold drawn bar stock and cold-finished carbon steel, with dimensions complying with AISC specifications.
- H. High-Strength Threaded Fasteners: Heavy hexagon structural bolts, heavy hexagon nuts, and hardened washers, quenched and tempered medium-carbon steel, complying with ASTM A 325 unless otherwise indicated, Provide galvanized bolts for all galvanized steel, and where indicated.
- I. Electrodes for Welding: Comply with AWS Code, use E70XX Series.
- J. Slide Bearings: Proprietary system of sliding bearing elements each fabricated using reinforced tetraflouoethylene sheets bonded with high temperature epoxy adhesive to steel plates in sizes and thicknesses indicated as manufactured by the Fluorocarbon Company, Pine Brook, New Jersey or approved equal.
- K. Standard Primer Paint: High solids, low VOC, rust inhibitive, all-purpose shop primer which is free of lead, chromates, and other heavy metals.

- L. Channel Slot Receivers for Masonry Anchors: 16 gage hot dipped galvanized, Heckmann No. 130 (8" long) [203.2 mm] or No. 133 (continuous) or approved equal.
- M. Non-shrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining product containing selected sila sands, portland cement, shrinkage compensating agents, plasticizing and water reducing agents, complying with CRD-C621. Products: Masterflow 713; Master Builders. Five Star Grout; U.S. Grout Corp or approve equal.
- N. Expansion Bolts: Zinc plated steel bolts as specified on Drawings. "HSL heavy-duty expansion anchors" and "Kwik-Bolts" as manufactured by Hilti, Inc. or approved equal.
- O. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds and repair painting galvanized steel, with dry film containing not less than 93 percent zinc dust by weight, and complying with DOD-P-21025A or SSPC-Paint 20.

2.2 FABRICATION

- A. Shop Fabrication and Assembly: Fabricate and assemble structural assemblies in the shop to greatest extent possible. Fabricate items of structural steel in accordance with AISC Specifications and as indicated on final shop drawings. Provide camber in structural members where indicated.
- B. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence, which will expedite erection and minimize field handling of materials.
- C. Where finishing is required, complete assembly, including welding of units, before start of finishing operations. Provide finish surfaces of members exposed in final structure free of markings, burrs and other defects.
- D. Architecturally Exposed Structural Steel: Fabricate architecturally exposed structural steel with exposed surfaces smooth, square, and free of surface blemishes, including pitting, rust and scale seam marks, roller marks, rolled trade names and roughness.
 - 1. Remove blemishes by filling, grinding, or by welding and grinding, prior to cleaning, treating and shop priming.
 - 2. Comply with fabrication requirements, including tolerance limits, of AISC's "Code of Standard Practice for Steel Building and Bridges" for architecturally exposed structural steel.
- E. Provide high-strength threaded fasteners for all bolted connections, except where unfinished bolts are shown.
 - 1. High-Strength Bolted Construction: Install high-strength threaded fasteners in accordance with AISC "Specifications for Structural Joints using ASTM A 325 or A 490 Bolts."
 - 2. Bolts need only to be tightened to a snug tight condition in accordance with the RCSC specification for shear/bearing bolts except for those identified as slip critical bolts. Slip critical connections are defined as follows:
 - a. All connections at braced bays including bracing, beams and columns.

- b. All connections noted as such on the plans.
- F. Welded Construction: Comply with AWS Code for procedures, appearance, and quality of welds, and methods used in correcting welding work.
- G. Assemble and weld built-up sections by methods, which will produce true alignment of axes without warp.
- H. Holes for other Work: Provide holes required for securing other work to structural steel framing, and for the passage of other work through steel framing members as shown on the final shop drawings. Provide threaded nuts welded to framing, and other specialty items as shown to receive other work.
- I. Cut drill or punch holes perpendicular to metal surfaces. Do not flame cut holes or enlarge holes by burning. Drill holes in bearing plates.
- J. Accessories: Provide accessories for masonry as follows:
 - 1. Shop welded strap anchors on beams and columns where indicated.
 - 2. Continuous channel slot receivers on columns adjacent to masonry walls.
 - 3. Vertically applied channel slot receivers at 32 inches on center on all beams adjacent to masonry walls.
- K. Galvanizing: Provide a zinc coating for those items indicated or specified to be galvanized, as follows:
 - 1. ASTM A 153 for galvanizing iron and steel hardware.
 - 2. ASTM A 123 for galvanizing rolled, pressed and forged steel shapes, plates, bars and strip 1/8 (3.175 mm): thick and heavier.
 - 3. ASTM A 386 for galvanizing assembled steel products.

2.3 SHOP PAINTING

- A. General: Shop paint structural steel, except those members or portions of members to be embedded in concrete, mortar or those members to be fire-proofed. Paint embedded steel, which is partially exposed on exposed portions and initial 2" (50.8 mm) of embedded areas only.
- B. Surface Preparation: After inspection, clean steel work to be painted. Remove loose rust, loose mill scale, and spatter, slag or flux deposits. Clean steel in accordance with Steel Structures Painting Council (SSPC) as follows:
 - 1. SSPC SP-3 "Power Tool Clean" for concealed steel.
 - 2. SSPC SP-10 "Near-White Blast Cleaning" for Architecturally Exposed Structural Steel.
- C. Painting: Immediately after surface preparation, apply structural steel primer paint in accordance with manufacturer's instructions and at a rate to provide dry film thickness of not less than 1.5 mils. Use a painting method, which results in full coverage of joints, corners, edges and exposed surfaces. Apply two coats of paint to those surfaces, which are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Erector must examine the areas and conditions under which structural steel work is to be installed and notify the Contractor, in writing, of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Erector.
- B. Erector must survey as-built anchor bolt, bearing plate and embedded plates used for beam connection layouts prior to setting structural steel. If structural steel is set prior to surveying, erector is responsible for all modifications necessitated by improperly located bolts or plates.
- C. Erector must inform the Architect when the erection of steel deviates from the approved shop drawings due to fabrication errors, misalignment of embeds and any additional type of deviation. The erector must submit, for review, a report of the deviation condition in writing, including cause and possible solution. A written acceptance of all deviations must be maintained at the jobsite for review by the Owner's testing laboratory.
- D. Temporary Support: Provide temporary guys, braces, falsework, cribbing, or other elements required to secure the steel framing against loads equal in intensity to design loads. Remove such temporary support only when permanent connections have been made and the steel framing is fully capable of supporting design loads, including any temporary constructions loads.

3.2 DELIVERY, STORAGE, AND HANDLING

- A. Shipping: Deliver steel in timely fashion, to permit the most efficient and economical flow of work. Deliver steel members properly marked for field assembly and erection.
- B. Deliver lintels, anchor bolts, washers, and other anchorage devices to be built into other work in time to avoid delays and permit their proper installation.
- C. Identification: Specially mark high-strength steel in accordance with requirements of ASTM A 6 and maintain markings until steel has been placed in final position.
- D. Storage: Protect steel and other materials of this section from damage and corrosion. If temporary storage at the project site is required, keep steel members off the ground, using platforms or pallets, in location easily accessible for inspection.

3.3 ERECTION

A. General: Erect structural steel in compliance with AISC Code and Specifications.

- B. Set structural frames accurately to the lines and elevations indicated. Align and adjust the various members forming a part of a complete frame or structure before permanently fastening. Clean bearing surfaces and other surfaces, which will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
- C. Level and plumb individual members of the structure within specified AISC tolerances.
- D. Establish required leveling and plumbing measurements on the mean operating temperature of the structure. Make allowances for the difference between temperature at time of erection and the mean temperature at which the structure will be when completed and in service.
- E. Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of base and bearing plates.
- F. Set loose and attached base plates and bearing plates for structural members on wedges or other adjusting devices.
- G. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims, but if protruding, cut off flush with edge of base or bearing plate prior to packing with grout.
- H. Pack grout solidly between bearing surfaces and bases or plates to ensure that no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure. For proprietary grout materials, comply with manufacturer's instructions.
- I. Splice members only where indicated and accepted on final shop drawings.
- J. Erection Bolts: On exposed welded construction, remove erection bolts, fill holes with plug welds and grind smooth at exposed surfaces.
- K. Comply with AISC specifications for bearing, adequacy for temporary connections, alignment and the removal of paint on surfaces adjacent to field welds.
- L. Do not enlarge unfair holes in members by burning or by the use of drift pins, except in secondary bracing members. Ream holes must be enlarged to admit bolts.
- M. Gas Cutting: Do not use gas cutting torches in the field for correcting fabrication errors in primary structural framing. Cutting will be permitted only on secondary members, which are not under stress, as acceptable to the Architect. Finish gas-cut sections equal to a sheared appearance when permitted.
- N. Expansion Bolts: Install in accordance with manufacturer's instructions using only acceptable carbide bits for drilling. Provide bolts with a minimum embedment of 5" unless otherwise noted on drawings.
 - 1. Expansion Bolts to Masonry: Anchor only to solid grouted masonry. If masonry is not grouted at the time of anchor installation, immediately notify General Contractor of condition. Do not proceed until condition is corrected by grouting masonry and curing for a minimum of three days.

O. Touch-up Painting: After erection, wire brush clean and paint scarred areas, welds, rust spots on steel, using same type of shop paint used on adjacent surfaces. Use galvanized repair paint on galvanized surfaces.

3.4 FIELD QUALITY CONTROL

- A. Owner will engage an independent testing and inspection agency to inspect high-strength bolted connections and welded connections and to perform tests and prepare test reports for all field inspections.
- B. The testing agency shall visit the fabricator's plant and verify that the fabricator's detailed fabrication and quality control procedures are in place and conform to industry standards. If the fabricator can demonstrate that they currently comply with the AISC quality certification program category I, the testing agency's plant inspection may be omitted.
- C. The testing agency will conduct tests in accordance with industry standards and the Special Inspections requirements of the building code. The testing agency shall prepare a report for each visit. Each report will state whether or not the tests comply with the requirements and specifically state any deviations.
- D. Deficiencies that were listed in the inspections and laboratory test reports need to be corrected at the Contractor's expense. Perform any additional tests to reconfirm if there is any more non-compliances of the original work and show compliance of corrected work.
- E. Beam Cambers: Testing agency shall verify that the beam cambers conform to the documents and the AISC tolerances.
- F. Shop Bolted Connections: Inspect in accordance with AISC specifications.
- G. Shop Welding: Inspect and test during fabrication of structural steel assemblies, as follows:
 - Verify welders' certifications and conduct inspections and tests as required. Record types and locations of defects found in the work. Record work required and performed to correct deficiencies.
 - 2. Perform visual inspection of all welds.
 - 3. Test ultrasonic inspection of all full penetration welds to comply with ASTM E 164.
 - 4. Perform additional testing at the testing agency™s option using ASTM E165, ASTM E704, ASTM E94 or ASTM E142.
- H. Field Bolted Connections: Inspect in accordance with AISC specifications.
- I. Field Welding: Inspect and test during erection of structural steel as follows:
 - 1. Perform visual inspection of all field welds.
 - 2. Test all full penetration welds. Test ultrasonic inspection of all full penetration welds to comply with ASTM E 164.

- 3. All expansion bolts shall be inspected in accordance with manufacturer™s requirements.
- J. Shear Connectors: Perform visual inspection and bend tests:
 - 1. Acoustic Inspection:
 - a. Perform acoustic inspection for 100% of studs.
 - b. Studs which do not ring when struck with a hammer shall be bent 15 degree. If no fracture occurs, stud is considered acceptable and left bent.
 - 2. In addition to above, test not less than 1 of each 100 studs by bending 15 degrees. If no fracture occurs, stud is considered acceptable and left bent.
 - 3. Rejectable studs:
 - a. If the number of rejectable studs on any building level exceeds 3% of those tested, perform additional testing on 1 of each 25 studs.

END OF SECTION 051200

SECTION 051210 - STRUCTURAL STEEL (MINOR)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION

- A. Extent of structural steel work as shown on drawings, including schedules, notes and details to show size and location of members, typical connections, and type of steel required.
- B. Products furnished but not installed under this section:
 - 1. Steel anchorages cast in concrete or installed in masonry.
 - 2. Loose lintels in masonry walls.
 - 3. Anchor bolts and leveling plates.
- C. General: Unless otherwise specifically approved in writing, furnish exact section, weights, and kinds of material specified, using details and dimensions shown.
- D. Details shown are typical; similar details apply to similar conditions, unless otherwise indicated.

1.3 QUALITY ASSURANCE

- A. Welding Procedures: Establish that joint welding procedures are prequalified or test in accordance with AWS D1.1 qualification procedures.
- B. Welder Qualifications: Welders must be currently certified under American Welding Society qualification procedures. If recertification is required, retesting will be the Contractor's responsibility.
- C. Regulatory Requirements: Unless other requirements of governing authorities or particular requirements of this specification are more stringent, comply with provisions of the following:
 - 1. AISC "Code of Standard Practice for Steel Buildings and Bridges."
 - 2. AISC "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design," with Commentary and Supplements.
 - 3. ANSI/AWS D1.1 -- Structural Welding Code Steel; American Welding Society.
 - 4. ASTM A 123 -- Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- D. Specification for Structural Joints Using ASTM A325 or A490 Bolts; Research Council on Structural Connections; American Institute of Steel Construction, Inc. (AISC).

STRUCTURAL STEEL (MINOR)

E. Specification for Structural Steel Buildings -- Allowable Stress Design and Plastic Design; American Institute of Steel Construction, Inc. (AISC).

1.4 SUBMITTALS

- A. Product Data: Upon request, submit producer's or manufacturer's data for products as follows, including sufficient data to show compliance with specified requirements:
 - 1. Shop Drawings: Submit complete shop drawings at 1/8 scale minimum for structural steel, including information on location, type, and size of all bolts, and welds, distinguishing between those made in the shop and those made in the field. (Reproduced contract drawings are not acceptable for use as erection plans.)
 - a. CAD files of the structural drawings are available for use by the contractor at the cost of \$200 per sheet. If files are desired, contact Ehlert/Bryan, Inc. at 703-827-9552. The files have been prepared in AutoCad version 2018.
 - 2. The Contractor shall verify all existing conditions and dimensions prior to submitting of shop drawings. Shop drawings shall not be submitted until all field checking of dimensions have been shown on the shop drawings.
 - 3. Welder Qualifications: Submit evidence that welders employed in the work are currently certified under AWS qualification procedures.

PART 2 - PRODUCTS

2.1 STEEL MATERIALS

- A. Structural Steel Angles, Channels, Tees, Plates, and Bars: ASTM A 36.
- B. Structural Steel Wide Flange Shapes: ASTM A572, Grade 50.
- C. Structural Tubing, Cold-Formed: ASTM A 500, Grade B.
- D. Steel Pipe: ASTM A 53. Type E or S, Grade B.
- E. Anchor Bolts: ASTM A 36
- F. High-strength Threaded Fasteners: Heavy hexagon structural bolts, heavy hexagon nuts, and hardened washers, quenched and tempered medium-carbon steel, complying with ASTM A 325.
- G. Shear Connectors: Headed stud type, ASTM A 108, Grade 1010 through 1020, made from cold drawn bar stock and cold-finished carbon steel, with dimensions complying with AISC specifications.
- H. Electrodes for Welding: Comply with AWS Code, use E70XX Series.

- I. Standard Primer Paint: High solids, low VOC, rust inhibitive, all-purpose shop primer which is free of lead, chromates, and other heavy metals. Acceptable products, or equivalent:
 - 1. Structural Steel Primer (B5ONV12 Red, B5OAV11 Gray) by Sherwin Williams Company, Cleveland, OH.
 - 2. Duraclad High Solids Shop Coat Metal Primer (33-082 Red, 33-083 Gray) by Duron Paints and Wall Coverings, Beltsville, MD
 - 3. Devoe Rustgard 4140 Quick Drying Shop Primer (4140-7100 Red, 4140-6120 Gray) by ICI Dulux Paints, Louisville, KY.
- J. Non-shrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining product containing selected silica sands, portland cement, shrinkage compensating agents, plasticizing and water reducing agents, complying with CRD-C621.

2.2 FABRICATION

- A. Shop Fabrication and Assembly: Fabricate and assemble structural assemblies in the shop to greatest extent possible. Fabricate items of structural steel in accordance with AISC Specifications and as indicated on final shop drawings. Provide camber in structural members where indicated.
- B. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence which will expedite erection and minimize field handling of materials.
- C. Connections: Weld or bolt shop connections, as indicated.
- D. Bolts need only to be tightened to a snug tight condition in accordance with the RCSC specification for shear/bearing bolts except for those identified as slip critical bolts.
- E. Slip critical connections are defined as follows: All connections at braced bays including bracing and beams. All connections noted as such on the plans.
- F. Welded Construction: Comply with AWS Code for procedures, appearance, and quality of welds, and methods used in correcting welding work.
- G. Galvanizing: Provide a zinc coating for those items indicated or specified to be galvanized, as follows: ASTM A 153 for galvanizing iron and steel hardware. ASTM A 123 for galvanizing rolled, pressed and forged steel shapes, plates, bars and strip 1/8: thick and heavier. ASTM A 386 for galvanizing assembled steel products.

2.3 SHOP PAINTING

- A. General: Shop paint structural steel, except those members or portions of members to be embedded in concrete or mortar. Paint embedded steel which is partially exposed on exposed portions and initial 2" of embedded areas only.
- B. Apply two coats of paint to those surfaces which are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

STRUCTURAL STEEL (MINOR)

- C. Do not paint surfaces which are scheduled to receive sprayed on fireproofing.
- D. Surface Preparation: After inspection and before galvanizing or shipping, clean steelwork to be painted. Remove loose rust, loose mill scale, and spatter, slag or flux deposits. Clean steel in accordance with Steel Structures Painting Council (SSPC) as follows: SSPC SP-3 "Power Tool Clean" for concealed steel.
- E. Painting: Immediately after surface preparation, apply structural steel primer paint in accordance with manufacturer's instructions and at a rate to provide dry film thickness of not less than 1.5 mils. Use painting method which result in full coverage of joints, corners, edges and exposed surfaces.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Erector must examine the areas and conditions under which structural steel work is to be installed and notify the Contractor, in writing, of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Erector.
- B. Erector must survey as-built anchor bolt, bearing plate and embedded plates used for beam connection layouts prior to setting structural steel. If structural steel is set prior to surveying, erector is responsible for all modifications necessitated by improperly located bolts or plates.
- C. Erector must inform the Architect when the erection of steel deviates from the approved shop drawings due to fabrication errors, misalignment of embeds and any additional type of deviation. The erector must submit, for review, a report of the deviation condition in writing, including cause and possible solution. A written acceptance of all deviates must be maintained at the jobsite for review by the Owner's testing laboratory.
- D. Temporary Support: Provide temporary guys, braces, falsework, cribbing, or other elements required to secure the steel framing against loads equal in intensity to design loads. Remove such temporary support only when permanent connections have been made and the steel framing is fully capable of supporting design loads, including any temporary constructions loads.

3.2 DELIVERY, STORAGE, AND HANDLING

- A. Shipping: Deliver steel in timely fashion, to permit the most efficient and economical flow of work. Deliver steel members properly marked for field assembly and erection.
- B. Deliver anchor bolts, washers, and other anchorage devices to be built into other work in time to avoid delays and permit their proper installation.

C. Storage: Protect steel and other materials of this section from damage and corrosion. If temporary storage at the project site is required, keep steel members off the ground, using platforms or pallets, in location easily accessible for inspection.

3.3 ERECTION

- A. General: Erect structural steel in compliance with AISC Code and Specifications.
- B. Set structural frames accurately to the lines and elevations indicated. Align and adjust the various members forming a part of a complete frame or structure before permanently fastening. Clean bearing surfaces and other surfaces which will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
- C. Level and plumb individual members of the structure within specified AISC tolerances.
- D. Pack grout solidly between bearing surfaces and bases or plates to ensure that no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure. For proprietary grout materials, comply with manufacturer's instructions.
- E. Splice members only where indicated and accepted on final shop drawings.
- F. Do not enlarge unfair holes in members by burning or by the use of drift pins, except in secondary bracing members. Ream holes that must be enlarged to admit bolts.
- G. Gas Cutting: Do not use gas cutting torches in the field for correcting fabrication errors in primary structural framing.
- H. Expansion Bolts to Masonry: Anchor only to masonry grouted solid. If masonry is not grouted at the time of anchor installation, immediately notify General Contractor of condition. Do not proceed until condition is corrected by grouting solid & cured for a minimum of three days.
- I. Expansion Bolts: Install in accordance with manufacturer's instructions using only acceptable masonry carbide bits for drilling. Provide bolts with a minimum embedment of 5" unless otherwise noted on drawings.
- J. Touch-up Painting: After erection, wire brush clean and paint scarred areas, welds, rust spots on steel, using same type of shop paint used on adjacent surfaces.

3.4 FIELD QUALITY CONTROL

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

- B. The testing agency shall visit the fabricator's plant and verify that the fabricator's detailed fabrication and quality control procedures are in place and conform to industry standards. If the fabricator can demonstrate that they currently comply with the AISC quality certification program category I, the testing agency's plant inspection may be omitted.
- C. The testing agency will conduct tests in accordance with industry standards and interpret the tests and state in each report whether the test specimens comply with the requirements and specifically state any deviations therefrom.
- D. Shop Bolted Connections: Inspect in accordance with AISC specifications.
- E. Shop Welding: Inspect and test during fabrication of structural steel assemblies, as follows:
 - Verify welders' certifications and conduct inspections and tests as required. Record types and locations of defects found in the work. Record work required and performed to correct deficiencies.
 - 2. Perform visual inspection of all welds.
 - 3. Test ultrasonic inspection of all full penetration welds to comply with ASTM E 164.
 - 4. Test all full penetration welds.
- F. Field Welding: Inspect and test during erection of structural steel as follows:
 - 1. Field Bolted Connections: Inspect in accordance with AISC specifications.
 - 2. Perform visual inspection of all field welds.
 - 3. Test all full penetration welds. Test ultrasonic inspection of all full penetration welds to comply with ASTM E 164.
 - 4. All expansion bolts shall be inspected in accordance with manufacturer¢s requirements.
- G. Shear Stud Tests:
 - 1. Acoustic Inspection:
 - a. Perform acoustic inspection for 100% of studs.
 - b. Studs which do not ring when struck with a hammer shall be bent 15 degree. If no fracture occurs, stud is considered acceptable and left bent.
 - 2. In addition to above, test not less than 1 of each 100 studs by bending 15 degrees. If no fracture occurs, stud is considered acceptable and left bent.
 - 3. Rejectable studs:
 - a. If the number of rejectable studs on any building level exceeds 3% of those tested, perform additional testing in accordance with 3.4.A.3.b on 1 of each 25 studs at that level.

END OF SECTION 05121

STRUCTURAL STEEL (MINOR)

SECTION 055113 - METAL PAN 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. Preassembled steel stairs with concrete-filled precast concrete treads.
- 2. Steel tube railings attached to metal stairs.
- 3. Steel tube handrails attached to walls adjacent to metal stairs.
- 4. Railing gates at the level of exit discharge.
- B. Related Requirements:
 - 1. Section 033000 "Cast-in-Place Concrete" for concrete fill for stair treads and platforms.
 - 2. Section 055213 "Pipe and Tube Railings" for pipe and tube railings.

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 metal stairs. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- C. Coordinate locations of hanger rods and struts with other work so that they do not encroach on required stair width and are within the fire-resistance-rated stair enclosure.

1.4 ACTION SUBMITTALS

- A. Product Data: For metal pan stairs and the following:
 - 1. Precast concrete treads.
 - 2. Nonslip aggregates and nonslip-aggregate finishes.
 - 3. Paint products.

- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
- C. Delegated-Design Submittal: For stairs and railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.
- B. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code Steel."
 - 2. AWS D1.3/D1.3M, "Structural Welding Code Sheet Steel."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

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

2.2 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For components exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Aluminum Extrusions: ASTM B 221, Alloy 6063-T6.

2.3 FASTENERS

- A. General: Provide zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 12 for exterior use, and Class Fe/Zn 5 where built into exterior walls. Select fasteners for type, grade, and class required.
- B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.
- C. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.
 - 1. Provide mechanically deposited or hot-dip, zinc-coated anchor bolts for exterior stairs.
- D. Post-Installed Anchors: Torque-controlled expansion anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.
 - 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
 - 2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

2.4 MISCELLANEOUS MATERIALS

- A. Shop Primers: Provide primers that comply with Section 099113 "Exterior Painting," Section 099123 "Interior Painting," and Section 099600 "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. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.

2.5 PRECAST CONCRETE TREADS

- A. Concrete Materials and Properties: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight, ready-mixed concrete with a minimum 28-day compressive strength of 5000 psi and a total air content of not less than 4 percent or more than 6 percent.
- B. Reinforcement: Galvanized, welded wire reinforcement, 2 by 2 inchesby 0.062-inchdiameter wire; comply with ASTM A 185/A 185M and ASTM A 82/A 82M, except for minimum wire size.

2.6 FABRICATION, GENERAL

- A. Provide complete stair assemblies, including metal framing, hangers, struts, railings, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.
 - 1. Join components by welding unless otherwise indicated.
 - 2. Use connections that maintain structural value of joined pieces.
- B. Preassembled Stairs: Assemble stairs in shop to greatest extent possible.
 Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- D. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- E. Form exposed work with accurate angles and surfaces and straight edges.
- F. Weld connections to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. Weld exposed corners and seams continuously unless otherwise indicated.
 - 5. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 3 welds: partially dressed weld with spatter removed.
- G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts unless otherwise indicated. Locate joints where least conspicuous.

2.7 STEEL-FRAMED STAIRS

- A. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM AMP 510, "Metal Stairs Manual," Commercial Class, unless more stringent requirements are indicated.
- B. Stair Framing:
 - 1. Fabricate stringers of steel plates or channels.
 - a. Provide closures for exposed ends of channel stringers.
 - 2. Construct platforms of steel plate or channel headers and miscellaneous framing members as needed to comply with performance requirements.
 - 3. Weld stringers to headers; weld framing members to stringers and headers. If using bolts, fabricate and join so bolts are not exposed on finished surfaces.
 - 4. Where stairs are enclosed by gypsum board assemblies, provide hanger rods or struts to support landings from floor construction above or below. Locate hanger rods and struts where they do not encroach on required stair width and are within the fire-resistance-rated stair enclosure.
 - 5. Where masonry walls support metal stairs, provide temporary supporting struts designed for erecting steel stair components before installing masonry.
- C. Metal Pan Stairs: Form risers, subtread pans, and subplatforms to configurations shown from steel sheet of thickness needed to comply with performance requirements, but not less than 0.067 inch.
 - 1. Steel Sheet: Galvanized-steel sheet.
 - 2. Attach risers and subtreads to stringers with brackets made of steel angles or bars. Weld brackets to stringers and attach metal pans to brackets by welding, riveting, or bolting.
 - 3. At Contractor's option, provide stair assemblies with metal pan subtreads filled with reinforced concrete during fabrication.
 - 4. Provide subplatforms of configuration indicated or, if not indicated, the same as subtreads. Weld subplatforms to platform framing.
 - a. Smooth Soffit Construction: Construct subplatforms with flat metal under surfaces to produce smooth soffits.

2.8 STAIR RAILINGS

- A. Comply with applicable requirements in Section 055213 "Pipe and Tube Railings." and
- B. Steel Tube Railings: Fabricate railings to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of tube, post spacings, and anchorage, but not less than that needed to withstand indicated loads.
- 1. Gates: Form gates from steel tube of same size and shape as top rails, with infill to match guards. Provide with cam-type, self-closing hinges for fastening to wall and overlapping stop with rubber bumper to prevent gate from opening in direction opposite egress.
- C. Welded Connections: Fabricate railings with 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. Finish welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 2 welds: completely sanded joint, some undercutting and pinholes are okay as shown in NAAMM AMP 521.
- D. Form changes in direction of railings as follows:
 - 1. By radius bends of radius indicated or by inserting prefabricated elbow fittings of radius indicated.
- E. Close exposed ends of railing members with prefabricated end fittings.
- F. 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 r less.
- G. Connect posts to stair framing by direct welding unless otherwise indicated.
- H. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnecting components and for attaching to other work. Furnish inserts and other anchorage devices for connecting to concrete or masonry work.
 - 1. For nongalvanized railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves, except galvanize anchors embedded in exterior masonry and concrete construction.
 - 2. Provide type of bracket with predrilled hole for exposed bolt anchorage and that provides 1-1/2-inch clearance from inside face of handrail to finished wall surface.
- I. Fillers: Provide fillers made from steel plate, or other suitably crush-resistant material, where needed to transfer wall bracket loads through wall finishes to structural supports. Size fillers to suit wall finish thicknesses and to produce adequate bearing area to prevent bracket rotation and overstressing of substrate.
- 2.9 FINISHES
 - A. Finish metal stairs after assembly.
 - B. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 3, "Power Tool Cleaning."

C. Apply shop primer to uncoated surfaces of metal stair components, except those with galvanized finishes and those to be embedded in concrete or masonry unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

PART 3 - EXECUTION

3.1 INSTALLING METAL PAN STAIRS

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

3.2 INSTALLING RAILINGS

- A. Adjust railing systems before anchoring to ensure matching alignment at abutting joints. Space posts at spacing indicated or, if not indicated, as required by design loads. Plumb posts in each direction. Secure posts and rail ends to building construction as follows:
 - 1. Anchor posts to steel by welding to steel supporting members.
 - 2. Anchor handrail ends to concrete and masonry with steel round flanges welded to rail ends and anchored with postinstalled anchors and bolts.
- B. Attach handrails to wall with wall brackets. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads. Secure wall brackets to building construction as follows:

- 1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
- 2. For hollow masonry anchorage, use toggle bolts.
- 3. For wood stud partitions, use hanger or lag bolts set into studs or wood backing between studs. Coordinate with carpentry work to locate backing members.
- 4. for steel-framed partitions, use hanger or lag bolts set into wood backing between studs. coordinate with stud installation to locate backing members.
- 5. for steel-framed partitions, use self-tapping screws fastened to steel framing or to concealed steel reinforcements.
- 6. for steel-framed partitions, use toggle bolts installed through flanges of steel framing or through concealed steel reinforcements.

3.3 ADJUSTING AND CLEANING

- 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 099113 "Exterior Painting," Section 099123 "Interior Painting," and Section 099600 "High-Performance Coatings."

END OF SECTION 055113

SECTION 057300 - DECORATIVE METAL RAILINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Exterior Steel railings: stairs, ramps, balconies, roof terrace.

1.2 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Manufacturer's product lines of railings assembled from standard components.
- B. Shop Drawings: Include plans, elevations, sections, and attachment details. Shop drawings to be signed and sealed by a qualified structural engineer
- C. Include coordination drawings indicating lighting and wiring in rail posts.
- D. Samples: For each type of exposed finish required.

1.3 INFORMATIONAL SUBMITTALS

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

1.4 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. Build mockups for each form and finish of railing consisting of two posts, top rail, infill area, and anchorage system components.

PART 2 - PRODUCTS

- 2.1 MANUFACTURERS
 - A. Custom Steel decorative railings
 - B. Product Options: Information on Drawings and in Specifications establishes requirements for system's aesthetic effects and performance characteristics.

DECORATIVE METAL RAILINGS

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval.

2.2 METALS, GENERAL

A. Brackets, Flanges, and Anchors: Same metal and finish as supported rails unless otherwise indicated.

2.3 STEEL AND IRON

A. Plates, Shapes, and Bars: ASTM A 36/A 36M.

2.4 FASTENERS

- A. Fastener Materials: Unless otherwise indicated, provide the following:
 - 1. Uncoated Steel Components: Plated-steel fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating where concealed; Type 304 stainless-steel fasteners where exposed.
 - 2. Galvanized-Steel Components: Plated-steel fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating.
 - 3. Dissimilar Metals: Type 304 stainless-steel fasteners.
- B. Post-Installed Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193 or ICC-ES AC308.
 - 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
 - 2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

2.5 MISCELLANEOUS MATERIALS

- A. Shop Primers: Provide primers that comply with
- B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
- C. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.6 FABRICATION

- A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage.
- B. Connections: Fabricate railings with welded connections unless otherwise indicated.
- C. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
 - 1. 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. At round rail pickets visible tack welds will be acceptable, provided they are neat and even.
- D. Mechanical Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
- E. Form changes in direction by inserting prefabricated elbow fittings.
- F. Close exposed ends of hollow railing members with prefabricated end fittings.
- G. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated.
- H. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.

2.7 STEEL AND IRON FINISHES

- A. Reference Section 099000 Painting and coating
- B. Preparing Nongalvanized Items for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
- C. Primer Application: Apply shop primer to prepared surfaces of railings unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.

2.8 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design stairs and railings.
- B. General: In engineering railings to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:
 - 1. Steel: 72 percent on minimum yield strength
- C. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Handrails and Guards:
 - a. Uniform load of 50 lbf/ft. applied in any direction
 - b. Concentrated load of 200lbf applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.

PART 3 - EXECUTION

- 3.1 INSTALLATION
 - A. Fit exposed connections together to form tight, hairline joints.
 - B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
 - 1. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
 - 2. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.
 - C. Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout.
 - D. Form or core-drill holes not less than 5 inches deep and 3/4 inch larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout.
 - E. Anchor posts to metal surfaces with flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members.

- F. Anchor railing ends to concrete and masonry with sleeves concealed within railing ends and anchored to wall construction with anchors and bolts.
- G. Attach handrails to walls with wall brackets.
- H. As indicated on drawings, epoxy anchor rods to masonry walls
- I. Secure wall brackets and railing end flanges to building construction as follows:
 - 1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
- J. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

END OF SECTION 057300

SECTION 061000 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Provide labor, materials, equipment and services necessary for and reasonably incidental to the completion of all rough carpentry work shown on the drawings or herein specified.

1.3 SUBMITTALS

- A. Submit product data for the following products: Metal framing anchors, hangers, connectors and miscellaneous hardware. Submittal must specifically denote products to be used. Generic catalogs or non-specific submittals will not be accepted.
- B. Engineered Wood Products: Submit shop drawings showing number sizes, layouts and installation details. Coordinate shop drawings with plumbing and mechanical penetrations.
- C. Material certificates for dimensional lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use as well as design values approved by the Board of Review of American Lumber Standards Committee.
- D. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
 - 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
 - 2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
 - a. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.

1.4 QUALITY ASSURANCE

- A. Single-Source Responsibility for Engineered Wood Products: Obtain each type of engineered wood products from one source from a single manufacturer.
- B. Single-Source Responsibility for Fire Retardant Treated Wood: Obtain each type of fire-retardant-treated wood products from one source for both treatment and fire-retardant formulation.
- C. Construct all work using new materials. Correct defects in workmanship so as not to delay the production schedule.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Delivery and Storage: Keep materials under cover and dry. Protect against exposure to weather and contact with damp or wet surfaces. Stack lumber as well as plywood and other panels; provide for air circulation within and around stacks and under temporary coverings including polyethylene and similar materials.
- B. For lumber and plywood pressure-treated with waterborne chemicals, place spacers between each bundle to provide air circulation.
- C. Maintain materials in an orderly fashion in the work and storage areas in such a manner to reduce risk of injury as well as minimize above, reject and waste.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
 - 1. Factory mark each piece of lumber with grade stamp of grading agency.
 - 2. Dress lumber, S4S, unless otherwise indicated.
- B. Inspection Agencies: Inspection agencies and the abbreviations used to reference them with lumber grades and species include the following:
 - 1. SPIB Southern Pine Inspection Bureau.
 - 2. WCLIB West Coast Lumber Inspection Bureau.
 - 3. WWPA Western Wood Products Association.
- C. Maximum Moisture Content of Lumber: 19 percent for 2-inch nominal thickness or less; no limit for more than 2-inch nominal thickness unless otherwise indicated.

- D. Engineered Wood Products: Acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.
 - 1. Allowable design stresses and fire-rating requirements, if any, as published by manufacturer, shall meet or exceed those indicated. Manufacturer[™]s published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

- A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground.
 - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.
 - 2. For exposed items indicated to receive a stained or natural finish, chemical formulations shall not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
 - 1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.
- D. Application: Treat items indicated on Drawings, and the following:
 - 1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 - 2. Wood sills, sleepers, blocking, and similar concealed members in contact with masonry or concrete.
 - 3. Wood framing and furring attached directly to masonry or concrete walls.
 - 4. Wood framing members that are less than 18 inches above the ground in crawlspaces or unexcavated areas.
 - 5. Wood floor plates that are installed over concrete slabs-on-grade.
 - 6. Wood framing exposed to weather.

2.3 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Where fire-retardant-treated materials are indicated, materials shall comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
- B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
 - 1. Treatment shall not promote corrosion of metal fasteners.
 - 2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
 - 3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.
 - 4. Design Value Adjustment Factors: Treated lumber shall be tested according to ASTM D 5664 and design value adjustment factors shall be calculated according to ASTM D 6841.
- C. Kiln-dry lumber after treatment to maximum moisture content of 19 percent. Kiln-dry plywood after treatment to maximum moisture content of 15 percent.

2.4 DIMENSION LUMBER

- A. For stud framing (2 to 4 inches thick, 2 to 6 inches wide) provide the following grade and species as designated on the drawings. If not designated provide:
 - 1. Southern Pine, 'Stud Grade' graded under SPIB rules.
 - 2. Spruce-Pine-Fir, 'Stud Grade' graded under NLGA rules.
 - 3. Hem-Fir (North), Graded under NLGA rules.
- B. For structural framing (2 to 4 inches thick, 5 inches and wider), provide the following grade and species as designated on the drawings. If not designated provide:
 - 1. Hem-Fir, 'No. 2' graded under WWPA rules.
 - 2. Southern Pine, 'No. 2' graded under SPIB rules.
 - 3. Spruce-Pine-Fir, 'No. 2' graded under NLGA rules. Spruce-Pine-Fir (South) is not allowed.
 - 4. Hem-Fir, (North) ~No. 2™ graded under NLGA rules.

2.5 TIMBERS

- A. For timbers (5 inches and thicker), provide material as designated on the drawings. If not designated, provide:
 - 1. Southern Pine, 'No. 2' per SPIB rules.
 - 2. Douglas-Fir, No. 2[™] per NLGA or WWPA rules.

2.6 MISCELLANEOUS LUMBER

- A. General: Provide lumber for support or attachment of other construction including rooftop equipment curbs and support bases, cant strips, bucks, nailers, blocking, furring, grounds, stripping, and similar members.
- B. Fabricate miscellaneous lumber from dimension lumber of sizes indicated and into shapes shown.
- C. Moisture content: 19 percent maximum for lumber items not specified to receive wood preservative treatment.
- 2.7 ENGINEERED WOOD PRODUCTS (Laminated Veneer Lumber, Wood I Joists and Headers)
 - A. General: Provide engineered wood products for which current model code evaluation / research reports exist that are acceptable to authorities having jurisdiction and that evidence compliance for the application indicated with specified requirements and the building code in effect for this Project.
 - B. Source Limitations: Obtain each type of engineered wood product from single source from a single manufacturer.
 - C. Laminated-Veneer Lumber: Structural composite lumber made from wood veneers with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D 5456 and manufactured with an exterior-type adhesive complying with ASTM D 2559.
 - 1. Veneer Characteristics: Douglas fir or southern pine veneers of varying thickness by widths and lengths standard with manufacturer, end-jointed with a lap-joint, butt joint, or scarf joint.
 - 2. Allowable Design Stresses: As follows, determined from empirical data or by rational engineering analysis, and demonstrated by comprehensive testing performed by a qualified independent testing laboratory:
 - a. Extreme Fiber Stress in Bending (Fb): 2500 psi (for 12-inch deep members).
 - b. Modulus of Elasticity (E): 1,900,000 psi.
 - c. Tension parallel to Grain (Ft): 1850 psi.
 - d. Compression Parallel to Grain (Fc): 2800 psi.

- e. Compression Perpendicular to Grain: 400 psi and 500 psi perpendicular and parallel to glue line.
- f. Horizontal Shear (Fv): 285 psi and 190 psi perpendicular and parallel to glue line.
- 3. Sizes: 1-3/4 inches thick by depth and length indicated.
- 4. Products: Subject to compliance with requirements, provide one of the following:
 - a. Laminated Veneer Lumber:
 - 1) œMicro-Lam LVL Headers and Beams," Truss Joist Corporation.
 - 2) "Gang-Lam Laminated Veneer Lumber," Mitek Wood Products, Inc.
- D. Prefabricated Wood I Joists: Units manufactured by bonding stress-graded lumber or LVL flanges to APA-Performance-Rated panel webs with exterior-type adhesives complying with ASTM D 2559, to produce I-shaped joists complying with the following requirements.
 - 1. Flange Material: Laminated veneer lumber or stress "graded limber
 - 2. Web Material: Oriented strand board or plywood.
 - 3. Allowable Design Stresses: As published by manufacturer, determined according to ASTM D 5055, and demonstrated by comprehensive testing performed by a qualified independent testing laboratory.
 - 4. Sizes: Depths and member designations indicated, with flanges not less than 1-1/2 inches wide. If joist is part of a fire-rated assembly, comply with minimum size requirements.
 - 5. Products: Subject to compliance with requirements, provide one of the following:
 - a. Prefabricated Wood I Joists:
 - 1) "Alpine Structures I-Beams and Headers," Wood Products Division, Alpine Engineered Wood Products, Inc.
 - 2) "Wood I-Beam Prefabricated Wooden I Joists and Headers," Georgia Pacific Corp.
 - 3) "TJI Joists," Truss Joist Corporation.
 - 6. Signed & Sealed design drawings and calculations, if required, will be designated in structural notes.
 - 7. Provide appropriately sized wood I hangers as required for joist supports.

2.8 CONSTRUCTION PANELS, GENERAL

- A. Construction Panel Standards: Comply with PS 1 "U.S. Product Standard for Construction and Industrial Plywood" for plywood construction panels and, for products not manufactured under PS 1 provisions, with APA PRP-108.
- B. Trademark: Furnish construction panels that are each factory-marked with APA trademark evidencing compliance with grade requirements.

2.9 CONCEALED PERFORMANCE-RATED CONSTRUCTION PANELS

- A. General: Where construction panels are indicated for the following concealed types of applications, provide APA Performance-Rated Panels complying with requirements designated under each application for grade designation, span rating, exposure durability classification, edge detail (where applicable), and thickness.
- B. Combination Subfloor-Underlayment: APA RATED STURD-I-FLOOR.
 - 1. Exposure Durability Classification: EXPOSURE 1.
 - 2. Span Rating and Thickness: As indicated on drawings or, if not indicated, as required to suit joist spacing indicated
 - 3. Edge Detail: Tongue and groove.
- C. Wall Sheathing: APA RATED SHEATHING.
 - 1. Exposure Durability Classification: EXTERIOR.
 - 2. Span Rating and Thickness: As indicated on drawings or, if not indicated, as required to suit stud spacing indicated.
- D. Roof Sheathing: APA RATED SHEATHING.
 - 1. Exposure Durability Classification: EXTERIOR.
 - 2. Span Rating and Thickness: As indicated on drawings or, if not indicated, as required to suit rafter or truss spacing indicated.

2.10 CONSTRUCTION PANELS FOR BACKING

A. Plywood Backing Panels: For mounting electrical or telephone equipment, provide fire-retardant-treated plywood panels with grade designation, APA C-D PLUGGED EXPOSURE 1, in thickness indicated, or, if not otherwise indicated, not less than 15/32 inch.

2.11 FASTENERS

- A. General: Provide fasteners of size and type indicated or as required for proper installation that comply with requirements specified in this article for material and manufacture.
 - 1. Where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with a hot-dip zinc coating per ASTM A 153 or of AISI Type 304 stainless steel.
 - 2. All fasteners for pressure treated or fire- retardant lumber to be hot " dip zinc coated or stainless steel.
- B. Nails, Wire, Brads, and Staples: ASTM F1667.
- C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction based on ICC-ESAC70

- D. Wood Screws: ANSI B18.6.1.
- E. Lag Bolts: ANSI B18.2.1.
- F. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and where indicated, flat washers.

2.12 METAL FRAMING ANCHORS

- A. Allowable design loads, as published by manufacturer, shall meet or exceed those of products of manufacturers listed. Manufacturer™s published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency. Framing anchors shall be punched for fasteners adequate to withstand same loads as framing anchors.
- B. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 coating designation.
 - 1. Use for interior locations unless otherwise indicated.
- C. Hot-Dip, Heavy-Galvanized Steel Sheet: ASTM A 653/A 653; structural steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 coating designation; and not less than 0.036 inch thick.
 - 1. Use for wood-preservative-treated or fire-treated lumber and where indicated.
- D. Joist Hangers: U-shaped joist hangers with 2-inch long seat and 1-1/4 inch wide nailing flanges at least 85 percent of joist depth.
- E. I-Joist Hangers: U-shaped joist hangers with 2-inch long seat and 1-1/4 inch wide nailing flanges full depth of joist. Nailing flanges provide lateral support at joist top chord.
- F. Top Flange Hangers: U-shaped joist hangers, full depth of joist, formed from metal strap with tabs bent to extend over and be fastened to supporting member.
- G. Bridging: Rigid, V-section, nailless type, 0.050 inch thick, length to suit joist size and spacing.
- H. Post Bases: Adjustable-socket type for bolting in place with standoff plate to raise post 1 inch above base with 2-inch minimum side cover, socket. 0.062 inch thick, and standoff and adjustment plates 0.108 inch thick. Post bases to be hot-dipped galvanized.
- I. Rafter Tie-Downs (Hurricane or Seismic Ties): Bent strap tie for fastening rafters or roof trusses to wall studs below. Tie fits over top of rafter or truss and fastens to both sides of rafter or truss, face of top plates and side of stud below.

J. Hold-Downs: Brackets for bolting to wall studs and securing to foundation walls with anchor bolts or to other hold-downs with threaded rods and designed with first of two bolts placed seven bolt diameters from reinforced base. See drawings and manufacturer™s product data for additional information.

2.13 MISCELLANEOUS MATERIALS

- A. Adhesives for Field Gluing Panels to Framing: Formulation complying with APA AFG-01 that is approved for use with type of construction panel indicated by both adhesive and panel manufacturer.
- B. Water Repellent Preservative: NWWDA-tested and -accepted formulation containing 3-iodo-2-propynyl butyl carbonate (IPBC) as its active ingredient.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Framing Standard: Comply with AF&PA™s WCD 1, œDetails for Conventional Wood Frame Construction,•unless otherwise indicated.
- B. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer[™]s written instructions.
- C. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate furring, nailers, blocking and similar supports to comply with requirements for attaching other construction.
- D. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant-treated plywood backing panels with classification marking of testing agency exposed to view.
- E. Install shear wall panels to comply with manufacturer™s written instructions and design drawings.
- F. Install metal framing anchors to comply with manufacturer™s written instructions. Install fasteners through each fastener hole.
- G. Install sill sealer gasket to form continuous seal between sill plates and foundation walls.
- H. Do not splice structural members between supports unless otherwise indicated.
- I. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

- 1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches (typ.) o.c.
- J. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:
 - 1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
 - 2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal thickness.
 - 3. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than 100 sq. ft. and to solidly fill space below partitions.
 - 4. Fire block concealed spaces behind combustible cornices and exterior trim at not more than 20 feet o.c.
- K. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- L. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
 - 1. Use inorganic boron for items that are continuously protected from liquid water.
 - 2. Use copper naphthenate for items not continuously protected from liquid water.
- M. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.
- N. Securely attach rough carpentry work to substrate by anchoring or fastening as indicated, complying with the following:

1.

2.

- ICC™s International Residential Code for One- and Two- Family Dwellings.
- 3. ICC-ES evaluation report for fastener.
- O. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug, but do not countersink nail heads unless otherwise indicated.
- P. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.

- 1. Comply with approved fastener patterns where applicable. Before fastening, mark fastener locations, using a template made of sheet metal, plastic, or cardboard.
- 2. Use finishing nails unless otherwise indicated. Countersink nail heads and fill holes with wood filler.
- 3. Use common nails unless otherwise indicated. Drive nails snug but do not countersink nail heads.

3.2 WOOD BLOCKING AND NAILER INSTALLATION

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

3.3 WOOD FURRING INSTALLATION

- A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.
- B. Furring to Receive Plywood or Hardboard Paneling: Install 1-by-3-inch nominal- size furring horizontally and vertically at 24 inches 600 mm o.c.
- C. Furring to Receive Gypsum Board Plaster Lath: Install 1-by-2-inch nominal- size furring vertically at 16 inches 400 mm o.c.

3.4 WALL AND PARTITION FRAMING INSTALLATION

- A. General: Provide single bottom plate and double top plates using members of 2-inch nominal thickness whose widths equal that of studs, except single top plate may be used for non-load-bearing partitions. Fasten plates to supporting construction unless otherwise indicated.
- B. Construct corners and intersections with three or more studs, except that two studs may be used for interior non-load-bearing partitions.
- C. Frame openings with multiple studs and headers. Provide nailed header members of thickness equal to width of studs. Support headers on jamb studs. Unless noted on drawings, provide headers and studs as follows:
 - For non-load-bearing partitions, provide double-jamb studs and headers not less than 4-inch nominal depth for openings 48 inches and less in width, 6-inch nominal depth for openings 48 to 72 inches in width, and not less than 10-inch nominal depth for openings 10 to 12 feet in width.
 - 2. For load-bearing walls, provide double-jamb studs for openings 60 inches and less in width, and triple-jamb studs for wider openings. Provide headers of depth indicated.

3.5 FLOOR JOIST FRAMING INSTALLATION

- A. General: Install floor joists with crown edge up and support ends of each member with not less than 1-1/2 inches of bearing on wood or metal, or 3 inches on masonry. Attach floor joists as follows:
 - 1. Where supported on wood members, by toe nailing or by using metal framing anchors.
 - 2. Where framed into wood supporting members, by using wood ledgers as indicated or, if not indicated, by using metal joist hangers.
- B. Fire Cuts: At joists built into masonry, bevel cut ends 3 inches and do not embed more than 4 inches.
- C. Frame openings with headers and trimmers supported by metal joist hangers; double headers and trimmers where span of header exceeds 48 inches.
- D. Do not notch in middle third of joists; limit notches to one-sixth depth of joist, one-third at ends. Do not bore holes larger than one-third depth of joist; do not locate closer than 2 inches from top or bottom.
- E. Provide solid blocking of 2-inch nominal thickness by depth of joist at ends of joists unless nailed to header or band.
- F. Lap members framing from opposite sides of beams, girders, or partitions not less than 4 inches or securely tie opposing members together. Provide solid blocking of 2-inch nominal thickness by depth of joist over supports.
- G. Provide solid blocking in joist space under jamb studs for openings and at posts in walls above.
- H. Under non-load-bearing partitions, provide double joists separated by solid blocking equal to depth of studs above.

3.6 CEILING JOIST AND RAFTER FRAMING INSTALLATION

- A. Ceiling Joists: Install with crown edge up and complying with requirements specified above for floor joists. Face nail to ends of parallel rafters.
 - 1. Where ceiling joists are at right angles to rafters, provide additional short joists parallel to rafters from wall plate to first joist; nail to ends of rafters and to top plate, and to first joist or anchor with framing anchors or metal straps. Provide 1-by-8-inch nominal- (190by-184-mm actual-) size or 2-by-4-inch nominal-size stringers spaced 48 inches o.c. crosswise over main ceiling joists.
- B. Rafters: Notch to fit exterior wall plates and toe nail or use metal framing anchors. Double rafters to form headers and trimmers at openings in roof frmaing, if any, and support with metal hangers. Where rafters abut at ridge, place directly opposite each other and nail to ridge member or use metal ridge hangers.

- 1. At valleys, provide double-valley rafters of size indicated or, if not indicated, of same thickness as regular rafters and 2 inches deeper. Bevel ends of jack rafters for full bearing against valley rafters.
- 2. At hips, provide hip rafter of size indicated or, if not indicated, of some thickness as regular rafters and 2 inches deeper. Bevel ends of jack rafters for full bearing against hip rafter.
- C. Provide collar beams (ties) as indicated or, if not indicated, provide 1-by-6-inch nominal- size boards between every third pair of rafters, but not more than 48 inches o.c. Locate below ridge member, at third point of rafter span. Cut ends to fit roof slope and nail to rafters.
- D. Provide special framing as indicated for eaves, dormers, and similar conditions if any.

3.7 TIMBER FRAMING INSTALLATION

- A. Install timber beams with crown edge up and provide not less than 4 inches of bearing on supports. Provide continuous members unless otherwise indicated; tie together over supports as indicated if not continuous.
- B. Where beams or girders are framed into pockets of exterior concrete or masonry walls, provide ½-inch airspace at sides and ends of wood members.
- C. Install wood posts using metal anchors indicated.
- D. Treat ends of timber beams and posts exposed to weather by dipping in water-repellent preservative for 15 minutes.

3.8 STAIR FRAMING INSTALLATION

- A. Provide stair framing members of size, space, and configuration indicated or, if not indicated, to comply with the following requirements:
 - 1. Size: 2-by-12-inch nominal size, minimum.
 - 2. Material solid lumber.
 - 3. Notching: Notch rough carriages to receive treads, risers, and supports; leave at least 3-1/2 inches of effective depth.
 - 4. Spacing: At least three framing members for each 36-inch clear width of stair.
- B. Provide stair framing with no more than 3/16-inch variation between adjacent treads and risers and no more than 3/8-inch variation between largest and smallest treads and risers within each flight.

3.9 SHEATHING, GENERAL

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:

Table 2304.9.1, "Fastening Schedule," in the ICC's International Building Code.
 2.

Code for One- and Two-Family Dwellings.

- 3. ICC-ES evaluation report for fastener.
- 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, parapet 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.
- H. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.
- I. Fastening Methods: Fasten panels as indicated below:
 - 1. Combination Subfloor-Underlayment:
 - a. Glue and nail to wood framing.
 - b. Space panels 1/8 inch apart at edges and ends.
 - 2. Subflooring:
 - a. Glue and nail to wood framing.
 - b. Space panels 1/8 inch apart at edges and ends.
 - 3. Wall, Roof, and Shear Wall Sheathing:
 - a. Nail to wood framing.
 - b. Space panels 1/8 inch apart at edges and ends.
 - 4. Underlayment:
 - a. Nail to subflooring.
 - b. Space panels 1/32 inch apart at edges and ends.

c. Fill and sand edge joints of underlayment receiving resilient flooring immediately before installing flooring.

END OF SECTION 061000

SECTION 061300 - HEAVY TIMBER CONSTRUCTION

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. Framing using timbers.
- B. Related Requirements:
 - 1. Section 061000 "Rough Carpentry" for dimension lumber items associated with heavy timber framing.
 - 2. Section 061516 "Wood Roof Decking."
 - 3. Section 061800 "Glued-Laminated Construction."

1.3 DEFINITIONS

- A. Timbers: Lumber of 5 inches nominal or greater in least dimension.
- B. Poles: Round wood members, called either "poles" or "posts" in the referenced standards.
- C. Inspection agencies, and the abbreviations used to reference them, include the following:
 - 1. NeLMA: Northeastern Lumber Manufacturers' Association.
 - 2. NHLA: National Hardwood Lumber Association.
 - 3. NLGA: National Lumber Grades Authority.
 - 4. SPIB: Southern Pine Inspection Bureau (The).
 - 5. WCLIB: West Coast Lumber Inspection Bureau.
 - 6. WWPA: Western Wood Products Association.

1.4 ACTION SUBMITTALS

- A. Product Data: For [preservative-treated wood products] [and] [timber connectors].
 - 1. For preservative-treated wood products. Include chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material.

HEAVY TIMBER CONSTRUCTION

- 2. For timber connectors. Include installation instructions.
- B. Sustainable Design Submittals:
 - 1. Chain-of-Custody Certificates: For certified wood products. Include statement of costs.
- C. Shop Drawings: For heavy timber framing. Show layout, dimensions of each member, and details of connections.
- D. Samples: Not less than 9 inches wide by 24 inches long, showing the range of variation to be expected in appearance, including surface texture, of wood products. [Apply a coat of penetrating sealer to Samples.]

1.5 INFORMATIONAL SUBMITTALS

- A. Material Certificates:
 - 1. For timbers specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by ALSC's Board of Review.
 - 2. For preservative-treated wood products. Indicate type of preservative used and net amount of preservative retained. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
- B. Certificates of Inspection: Issued by lumber-grading agency for exposed timber not marked with grade stamp.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Schedule delivery of materials to avoid extended on-site storage and to avoid delaying the Work.
- B. Store materials under cover and protected from weather and contact with damp or wet surfaces. Provide for air circulation within and around stacks and under temporary coverings.

PART 2 - PRODUCTS

- 2.1 TIMBER
 - A. Comply with DOC PS 20 and with grading rules of lumber-grading agencies certified by ALSC's Board of Review as applicable.
 - 1. Factory mark each item of timber with grade stamp of grading agency.

- 2. For exposed timber indicated to receive a stained or natural finish, apply grade stamps to surfaces that are not exposed to view, or omit grade stamps and provide certificates of grade compliance issued by grading agency.
- B. Structural Properties: Provide any species and grade that, for moisture content provided, complies with required structural properties.
 - 1. Allowable Stress Ratings for 12-Inch Nominal Depth: [Fb 1500 psi and E 1,500,000 psi] [Fb 1300 psi and E 1,300,000 psi] [As indicated on Drawings] <Insert values>.
- C. Moisture Content: Provide timber with 19 percent maximum moisture content at time of dressing[or provide timber that is unseasoned at time of dressing but with 19 percent maximum moisture content at time of installation].
- D. Dressing: Provide dressed timber (S4S) unless otherwise indicated.

2.2 PRESERVATIVE TREATMENT

- A. Pressure treat materials with waterborne preservative according to AWPA U1; Use Category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.
- B. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
 - 1. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not contain colorants, bleed through, or otherwise adversely affect finishes.
- C. Use process that includes water-repellent treatment.
- D. Use process that does not include water repellents or other substances that might interfere with application of indicated finishes.
- E. After treatment, redry materials to 19 percent maximum moisture content.
- F. Mark treated materials with treatment quality mark of an inspection agency approved by ALSC's Board of Review.
 - 1. For exposed items indicated to receive a stained or natural finish, mark each piece on surface that is not exposed.
- G. Application: Treat all heavy timber framing unless otherwise indicated.
 - 1. Sills and similar members in contact with masonry or concrete.
 - 2. Timber framing members less than 18 inches above grade.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Erect heavy timber framing true and plumb. Provide temporary bracing to maintain lines and levels until permanent supporting members are in place.
 - 1. Install horizontal and sloping members with crown edge up, and provide not less than 4 inches of bearing on supports. Provide continuous members unless otherwise indicated; tie together over supports with metal strap ties if not continuous.
 - 2. Handle and temporarily support heavy timber framing to prevent surface damage, compression, and other effects that might interfere with indicated finish.
- B. Framing Built into Masonry: Provide 1/2-inch clearance at tops, sides, and ends of members built into masonry, and bevel cut ends 3 inches; do not embed more than 4 inches unless otherwise indicated.
- C. Cutting: Avoid extra cutting after fabrication. Where field fitting is unavoidable, comply with requirements for shop fabrication.
- D. Fitting: Fit members by cutting and restoring exposed surfaces to match specified surfacing.
 - 1. Predrill for fasteners using timber connectors as templates.
 - 2. Finish exposed surfaces to remove planing or surfacing marks, and to provide a finish equivalent to that produced by machine sanding with No. 120 grit sandpaper.
 - 3. Coat crosscuts with end sealer.
 - 4. Where preservative-treated members must be cut during erection, apply a field-treatment preservative to comply with AWPA M4.
 - a. Use inorganic boron (SBX) treatment for members not in contact with the ground and continuously protected from liquid water.
 - b. Use copper naphthenate treatment for members in contact with the ground or not continuously protected from liquid water.
- E. Install timber connectors as indicated.
 - 1. Unless otherwise indicated, install bolts with same orientation within each connection and in similar connections.
 - 2. Install bolts with orientation as indicated or, if not indicated, as directed by Architect.

3.2 ADJUSTING

A. Repair damaged surfaces and finishes after completing erection. Replace damaged heavy timber framing if repairs are not approved by Architect.

END OF SECTION 061300

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. Parapet sheathing.
- B. Related Requirements:
 - 1. [Section 061000 "Rough Carpentry"] [Section 061053 "Miscellaneous Rough Carpentry"] for plywood backing panels.
 - 2. Section 072500 "Weather Barriers" for water-resistive barrier applied over wall sheathing.

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 D5516.
 - 4. For products receiving waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
 - 5. For air-barrier and water-resistant glass-mat gypsum sheathing, include manufacturer's technical data and tested physical and performance properties of products.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: From air-barrier and water-resistant glass-mat gypsum sheathing manufacturer, certifying compatibility of sheathing accessory materials with Project materials that connect to or that come in contact with the sheathing.
- B. Product Test Reports: For each air-barrier and water-resistant glass-mat gypsum sheathing assembly, indicating compliance with specified requirements, for tests performed by a qualified testing agency.

1.5 DELIVERY, STORAGE, AND HANDLING

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance Ratings: As tested according to ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.
- B. Air-Barrier and Water-Resistant Glass-Mat Gypsum Sheathing Performance: Air-barrier and water-resistant glass-mat gypsum sheathing 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] [, tie-ins to other installed air barriers], and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

2.2 WOOD PANEL PRODUCTS

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

SHEATHING

2.3 FIRE-RETARDANT-TREATED PLYWOOD

- A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
- B. Fire-Retardant-Treated Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
 - 1. Use treatment that does not promote corrosion of metal fasteners.
 - 2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated plywood by pressure process after being subjected to accelerated weathering according to ASTM D2898. Use for exterior locations and where indicated.
 - 3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D3201/D3201M at 92 percent relative humidity. Use where exterior type is not indicated.
- C. Kiln-dry material after treatment to a maximum moisture content of 15 percent. Do not use material that is warped or does not comply with requirements for untreated material.
- D. Identify fire-retardant-treated plywood with appropriate classification marking of qualified testing agency.
- E. Application: Treat plywood indicated on Drawings, and the following:
 - 1. @ B3: Roof and wall sheathing within 24 inches of exterior walls.
 - 2. @ B3: Roof sheathing.
 - 3. @ B3: Exterior walls as indicated on drawings.

2.4 WALL SHEATHING

- A. Oriented-Strand-Board Sheathing: DOC PS 2, Exposure 1, Structural I sheathing.
 - 1. Nominal Thickness: Not less than 19/32 (5/8) inch.

2.5 ROOF SHEATHING

- A. Plywood Sheathing:
 - 1. Span Rating: Not less than 24/0.
 - 2. Nominal Thickness: Not less than 19/32 (5/8) inch.

2.6 PARAPET SHEATHING

- A. Oriented-Strand-Board Sheathing: DOC PS 2, sheathing.
 - 1. Nominal Thickness: Not less than 5/8 inch.

2.7 SUBFLOORING AND UNDERLAYMENT

- A. Plywood Combination Subfloor-Underlayment: DOC PS 1, single-floor panels.
 - 1. Nominal Thickness: Not less than 23/32 inch.
 - 2. Edge Detail: Tongue and groove.

2.8 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 parapet wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M.
 - 2. For roof parapet wall sheathing, provide fasteners with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B117.
- B. Nails, Brads, and Staples: ASTM F1667.
- C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- D. Screws for Fastening Sheathing to Wood Framing: ASTM C1002.
- E. Screws for Fastening Wood Structural Panels to Cold-Formed Metal Framing: ASTM C954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.
- 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.
 - 1. For steel framing less than 0.0329 inch thick, use screws that comply with ASTM C1002.
 - 2. For steel framing from 0.033 to 0.112 inch thick, use screws that comply with ASTM C954.

G. Screws for Fastening Composite Nail Base Insulated Roof 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 B117. Provide washers or plates if recommended by sheathing manufacturer.

2.9 MISCELLANEOUS MATERIALS

A. Adhesives for Field Gluing Panels to Wood Framing: Formulation complying with ASTM D3498 that is approved for use with type of construction panel indicated by manufacturers of both adhesives and panels.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
 Arrange joints so that pieces do not span between fewer than three support members.
- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.
- C. Securely attach to substrate by fastening as indicated, complying with the following:
 - 1. Table 2304.9.1, "Fastening Schedule," in the ICC's International Building Code.
 - 2. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in the ICC's International Residential Code for One- and Two-Family Dwellings.
 - 3. ICC-ES evaluation report for fastener.
- 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 parapet 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.

SHEATHING

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. Combination Subfloor-Underlayment:
 - a. Glue and nail to wood framing.
 - b. Screw to cold-formed metal framing.
 - 2. Wall and Roof Sheathing:
 - a. Nail to wood framing. Apply a continuous bead of glue to framing members at edges of wall sheathing panels.
 - b. Screw to cold-formed metal framing.

END OF SECTION 061600

SECTION 061753 - PREFABRICATED PLATE CONNECTED WOOD TRUSSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Extent and Configuration: of prefabricated wood trusses as indicated on drawings including truss to truss connections, temporary and permanent bracing as described herein, and reinforcement for wind loads on end gable trusses.
- B. Special Attention: The contractor's special attention is drawn to the requirement for providing a roof truss system, complete with all temporary bracing required for safe erection and all permanent bracing required to laterally brace or limit buckling lengths of individual truss members. Bracing size, location, and connections shall be the design responsibility of the Specialty Engineer and shall be shown in the shop drawings.

1.3 CODES & STANDARDS

- A. TPI Standards: Comply with applicable requirements and recommendations of the following Truss Plate Institute (TPI) publications:
 - 1. "Design Specifications for Metal Plate Connected Wood Trusses."
 - 2. "Design Specification for Metal Plate Connected Parallel Chord Wood Trusses."
 - 3. "Commentary and Recommendations for Handling and Erecting Wood Trusses."
 - 4. "Commentary and Recommendations for Bracing Wood Trusses."
 - 5. "Quality Standard for Metal Plate Connected Wood Trusses."
 - 6. "National Design Specifications for Wood Construction (NFPA)."
- B. Exception: All statements in the aforementioned standards that attribute design responsibility for "all permanent bracing" to the Architect/Engineer of record shall be modified to reflect the requirements herein.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacture of prefabricated wood trusses with three years minimum experience in prefabricating metal plate connected wood trusses similar to those of this project.

- B. Specialty Engineer Qualifications: A professional engineer, registered in the state of the proposed project, whose specialization is the design and installation of metal-plated wood trusses.
- C. Performance Requirements: Design trusses to support live, dead, and wind loads as indicated on the drawings. Deflection of trusses to be limited to L/240 for total load and L/360 for live load, where L is the truss span. The total lateral spread of scissors trusses shall be limited to the L/400 or 1 inch, whichever is less.
- D. Single Source Responsibility for Connector Plates: Provide metal connector plates from a single manufacturer.

1.5 SUBMITTALS

- A. Submit shop drawings and product data for review. Shop drawings shall include erection plans, lumber species, grade, sizes, dimensions, pitches, camber, configuration, plate sizes, loadings, and spacing for each type of truss required; include design calculations, service load deflection, and special treatment requirements.
- B. Show all bracing sizes, locations and connections on erection plans required to meet the guidelines of the Truss Plate Institute, safely erect the trusses and laterally brace or limit buckling lengths of individual truss members.
- C. Show reinforcement details and/or bracing, complete with sizes, locations, and connections for end gable trusses subject to wind loading
- D. Provide shop drawings consisting of truss design calculations and erection plans. Calculations and erection plans shall be signed and sealed by a Specialty Engineer registered in the state of the proposed project.
- E. All field modifications to the prefabricated trusses shall be designed by a Specialty Engineer. The modifications shall be submitted to the Architect for review and shall contain the reason for the repair, the plan location, nail patterns, lumber types, and other pertinent data required for the repair. The sketch shall be signed and sealed by the Specialty Engineer registered in the state of the proposed project.
- F. Product data for lumber, metal connector plates, metal hangers, and miscellaneous hardware.
- 1.6 DELIVERY, STORAGE, AND HANDLING
 - A. Deliver and store products above the ground surface and in a way to prevent warping and twisting of the materials. Transport and store trusses in vertical position resting on bearing ends. Protect trusses from moisture, warpage, and distortion during transit and when stored.
PART 2 - PRODUCTS

2.1 GENERAL

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering metal connector plates that may be incorporated into the work.
- B. Inspection Agencies: Inspection agencies and the abbreviations used to reference them to lumber grades and species include the following:
 - 1. NLGA National Lumber Grades Authority (Canadian).
 - 2. SPIB Southern Pine Inspection Bureau.
 - 3. WCLIB West Coast Lumber Inspection Bureau.
 - 4. WWPA Western Wood Products Association.
 - 5. Minimum Lumber Grade "No. 2"
 - 6. Moisture Content: Seasoned, with 19 percent maximum moisture content at time of dressing and shipment for sizes 2 inches or less in nominal thickness, unless otherwise indicated.

2.2 METAL CONNECTOR PLATES

- A. General: Fabricate connector plates from metal complying with requirements indicated in this article.
- B. Hot-Dip Galvanized Steel Sheet: Structural (physical) quality steel sheet complying with ASTM A 446, Grade A; zinc coated by hot-dip process to comply with ASTM A 525, Designation G60; minimum coated metal thickness indicated but not less than 0.036 inch.
- C. Electrolytic Zinc-Coated Steel Sheet: Structural (physical quality steel sheet complying with ASTM A 591, Coating Class C, and, for structural properties, with ASTM A 446, Grade A; zinc coated by electro-deposition; with minimum coated metal thickness indicated but not less than 0.047 inch.

2.3 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
- B. Where truss members are exposed to weather or to high relative humidities, provide fasteners with a hot-dip zinc coating per ASTM A 153 or of AISI Type 304 stainless steel.
- C. Nails, Wire, Brads, and Staples: FS FF-N-105.
- D. Power Driven Fasteners: National Evaluation Report NER-272.
- E. Wood Screws: ANSI B18.6.1.

PREFABRICATED PLATE CONNECTED WOOD TRUSSES

- F. Lag Bolts: ANSI B18.2.1.
- G. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and where indicated, flat washers.

2.4 METAL FRAMING ANCHORS

- A. General: Provide metal framing anchors of type, size, metal, and finish indicated that comply with requirements specified including the following:
- B. Current Evaluation/Research Reports: Provide products for which reports exist from a model code organization acceptable to authorities having jurisdiction that evidence compliance of metal framing anchors for application indicated with the building code in effect for this Project.
- C. Allowable Design Loads: Provide products for which manufacturer publishes allowable design loads that are determined from empirical data or by rational engineering analysis and that are demonstrated by comprehensive testing performed by a qualified independent testing laboratory.
- D. Galvanized Steel Sheet: Steel Sheet zinc-coated by hot-dip process on continuous lines prior to fabrication to comply with ASTM A 525 for Coating Designation G60 and with ASTM A 446, Grade A (structural quality); ASTM A 526 (commercial quality); or ASTM A 527 (lock-forming quality); as standard with manufacturer for type of anchor indicated.

2.5 FIRE-RETARDANT TREATMENT BY PRESSURE PROCESS

- A. General: Where fire-retardant-treated wood is indicated, pressure impregnate lumber with fire-retardant chemicals to comply with AWPA C20 for treatment type indicated; identify "fire-retardant-treated wood" with appropriate classification marking of Underwriters Laboratories, Inc.; US Testing; Timber Products Inspection, Inc., or other testing and inspecting agency acceptable to authorities having jurisdiction.
- B. Current Evaluation/Research Reports: Provide fire-retardant-treated wood for which a current evaluation report exists from a model code organization acceptable to authorities having jurisdiction that evidences compliance of fire-retardant treated wood for application indicated with the building code in effect for this Project.
- C. Interior Type A: For interior locations use fire-retardant chemical formulation that produces treated lumber with the following properties under conditions present after installation:
 - 1. No reduction takes place in bending strength, stiffness, and fastener holding capacities below values published by manufacturer of chemical formulation that are based on tests by a qualified independent testing laboratory of treated wood products identical to those indicated for this Project under elevated temperature and humidity conditions simulating installed conditions.

MasterSpec

- 2. No other form of degradation occurs due to acid hydrolysis or other causes related to manufacture and treatment.
- 3. No corrosion of metal connector plates, metal framing anchors, and fasteners results from their contact with treated wood.
- 4. Inspect each piece of treated lumber after drying and discard damaged or defective pieces.
- D. Available Products: Subject to compliance with requirements, "Interior Type A" fire-retardant-treated wood products that may be incorporated in the Work include, but are not limited to, the following:
 - 1. "Dricon," Hickson Corporation.
 - 2. "Pyro-Guard," Hoover Treated Wood Products.
 - 3. "FirePro," Koppers Performance Chemicals, Inc.

2.6 FABRICATION

- A. Verify dimensions and site conditions prior to fabrication.
- B. Cut truss members to accurate lengths, angles, and sizes to produce close-fitting joints with wood-to-wood bearing in assembled units.
- C. Fabricate metal connector plates to size, configuration, thickness, and anchorage details required to withstand design loadings 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 joints closely fitted to comply with tolerances specified in TPI "Quality Standard for Metal Plate Connected Wood Trusses." Position members to produce design camber indicated.
- E. Connect truss members by means of metal connector plates accurately located and securely fastened to each side of wood members by means indicated or approved.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Erect and brace trusses to comply with applicable requirements of referenced TPI standards.
- B. Erect trusses with plane of truss webs vertical (plumb) and parallel to each other, located accurately at design spacings indicated.
- C. Anchor trusses securely at all bearing points to comply with methods and details indicated.
- D. Install permanent bracing and related components in accordance with the approved shop drawings and to comply with other indicated requirements.

MasterSpec

- E. Do not cut or remove truss members, or alter the trusses or bracing in any way without written permission from the Specialty Engineer.
- 3.2 TOLERANCES
 - A. Framing Members: 1/2 inch maximum from true position
 - B. Wall Studs: 1/8 inch per ten feet.

SECTION 062013 - EXTERIOR FINISH CARPENTRY

SECTION 064023 - INTERIOR ARCHITECTURAL WOODWORK

1.1 QUALITY ASSURANCE

A. Mockups for typical interior architectural woodwork.

1.2 INTERIOR STANDING AND RUNNING TRIM FOR TRANSPARENT FINISH

- A. Architectural Woodwork Standards Grade: Premium.
- B. Species: White oak.
- C. Cut: Rift cut/rift sawn.
- D. Fire-retardant treated.
- 1.3 INTERIOR STANDING AND RUNNING TRIM FOR OPAQUE FINISH
 - A. Architectural Woodwork Standards Grade: Economy.
 - B. Wood Species: Any closed-grain hardwood.
 - C. Fire-retardant treated.

1.4 CLOSET AND UTILITY SHELVING

- A. Architectural Woodwork Standards Grade: Economy.
- B. Wood Species: Match species indicated for other types of transparent-finished architectural woodwork located in same area of building unless otherwise indicated .
- C. Wood Finish: Opaque .
- 1.5 INTERIOR FRAMES AND JAMBS FOR TRANSPARENT FINISH
 - A. Architectural Woodwork Standards Grade: Premium.
 - B. Species: White oak.
 - C. Cut: Rift cut/rift sawn.
- 1.6 INTERIOR FRAMES AND JAMBS FOR OPAQUE FINISH
 - A. Architectural Woodwork Standards Grade: Economy.
 - B. Wood Species: Any closed-grain hardwood.

INTERIOR ARCHITECTURAL WOODWORK

064023 - 1

- 1.7 FINISHING
 - A. Transparent Finish: Custom Grade.
 - 1. Shop finished.
 - B. Opaque Finish: Custom Grade.
 - 1. Shop primed.
 - 2. Shop finished.
- 1.8 INSTALLATION
 - A. Lumber and trim for painted applications; primed, including both faces and edges.

SECTION 064113 - WOOD-VENEER-FACED ARCHITECTURAL CABINETS

PART 1 - GENERAL

1.1 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to support loads imposed by installed and fully loaded cabinets.
- B. Hardware Coordination: Distribute copies of approved hardware schedule specified in [Section 087100 "Door Hardware"] [Section 087111 "Door Hardware (Descriptive Specification)"] to manufacturer of architectural cabinets; coordinate Shop Drawings and fabrication with hardware requirements.

1.2 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver cabinets until painting and similar finish operations that might damage architectural cabinets have been completed in installation areas. Store cabinets in installation areas or in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.3 FIELD CONDITIONS

- A. Environmental Limitations without Humidity Control: 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 levels planned for building occupants during the remainder of the construction period.
- B. Environmental Limitations with Humidity Control: 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 [25 and 55] [43 and 70] [20 and 50] <Insert numbers> 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/concealed by construction, 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.

PART 2 - PRODUCTS

2.1 FABRICATION

- A. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.
- B. Fabricate architectural cabinets to dimensions, profiles, and details indicated. Ease edges and corners to 1/16-inch radius unless otherwise indicated.
- C. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
 - 1. Notify Architect seven days in advance of the dates and times architectural cabinet fabrication will be complete.
 - 2. Trial fit assemblies at manufacturer's 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.
- E. Install glass to comply with applicable requirements in Section 088000 "Glazing" and in GANA's "Glazing Manual."
 - 1. For glass in wood frames, secure glass with removable stops.
 - 2. For exposed glass edges, polish and grind smooth.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition cabinets to humidity conditions in installation areas for not less than 72 hours.

3.2 INSTALLATION

- A. Assemble cabinets and complete fabrication at Project site to extent that it was not completed in the shop.
- B. 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 cabinet surface.
 - 1. For shop-finished items, use filler matching finish of items being installed.
- C. Install cabinets level, plumb, and true in line to a tolerance of 1/8 inch in 96 inches using concealed shims.
 - 1. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
 - 2. Install cabinets without distortion so doors and drawers fit openings 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.
 - 3. Maintain veneer sequence matching of cabinets with transparent finish.
 - 4. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches o.c. with [No. 10 wafer-head screws sized for not less than 1-1/2-inch penetration into wood framing, blocking, or hanging strips] [No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish] [toggle bolts through metal backing or metal framing behind wall finish].
- D. Field Finishing: See for finishing of installed architectural cabinets.

3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects. Where not possible to repair, replace architectural cabinets. Adjust joinery for uniform appearance.
- B. Clean, lubricate, and adjust hardware.
- C. Clean cabinets on exposed and semiexposed surfaces. Touch up finishes to restore damaged or soiled areas.

MasterSpec

SECTION 064600 - WOOD TRIM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Interior standing and running trim.
 - 2. Wood furring, blocking, shims, and hanging strips for installing woodwork items unless concealed within other construction before woodwork installation.
 - 3. Shop priming of wood trim.
 - 4. Shop finishing of wood trim.
- B. Related Requirements:
 - 1. Section 061000 "Rough Carpentry" for wood furring, blocking, and shims required for installing wood trim and concealed within other construction before wood trim installation.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product, including panel products finishing materials and processes.
- B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
- C. Samples for Initial Selection:
 - 1. Shop-applied transparent finishes.
 - 2. Shop-applied opaque finishes.
 - 3. PVC edge material.

1.4 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

- 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 mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Build mockups of typical wood trim as shown on Drawings.
 - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver wood trim until operations that could damage wood trim have been completed in installation areas. If wood trim must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.6 FIELD CONDITIONS

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

1.7 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that wood trim can be supported and installed as indicated.

PART 2 - PRODUCTS

2.1 WOOD TRIM, GENERAL

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

- 2.2 INTERIOR STANDING AND RUNNING TRIM FOR TRANSPARENT FINISH
 - A. Grade: Premium.
- 2.3 INTERIOR STANDING AND RUNNING TRIM FOR OPAQUE FINISH
 - A. Grade: Economy.
 - B. Wood Species: Any closed-grain hardwood .

2.4 WOOD MATERIALS

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of wood trim 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 for Interior Materials: 5 to 10 percent.
- B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of wood trim and quality grade specified unless otherwise indicated.
 - 1. 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.

2.5 HARDWARE AND ACCESSORIES

A. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081.

2.6 MISCELLANEOUS MATERIALS

- A. Exterior Blocking, Shims, and Nailers: Softwood or hardwood lumber, pressure-preservative treated, kiln dried to less than 15 percent moisture content.
 - 1. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC3b.
- B. Interior Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.
- C. Provide self-drilling screws for metal-framing supports, as recommended by metal-framing manufacturer.

D. 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.

2.7 FABRICATION

- A. Fabricate wood trim to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:
 - 1. Edges of Solid-Wood (Lumber) Members: 1/16 inch unless otherwise indicated.
 - 2. Edges of Rails and Similar Members More Than 3/4 Inch Thick: 1/8 inch.
- B. Backout or groove backs of flat trim members and kerf backs of other wide, flat members except for members with ends exposed in finished work.
- C. Assemble casings in shop except where shipping limitations require field assembly.
- D. Assemble moldings in shop to maximum extent possible. Miter corners in shop and prepare for field assembly with bolted fittings designed to pull connections together.

PART 3 - EXECUTION

3.1 PREPARATION

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

3.2 INSTALLATION

- A. Grade: Install wood trim to comply with same grade as item to be installed.
- B. Assemble wood trim and complete fabrication at Project site to the extent that it was not completed in the shop.
- C. Install wood trim 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 wood trim to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

- E. Anchor wood trim 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. Standing and Running Trim: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to greatest extent possible. Do not use pieces less than 60 inches long except where shorter single-length pieces are necessary. Scarf running joints and stagger in adjacent and related members.
 - 1. Fill gaps, if any, between top of base and wall with latex sealant, painted to match wall.
 - 2. Install standing and running trim with no more variation from a straight line than 1/8 inch in 96 inches.
 - 3. Install wall railings on indicated metal brackets securely fastened to wall framing.
 - a. Space rail brackets not more than 48" o.c.
- G. Touch up finishing work specified in this Section after installation of wood trim. 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.
- H. Refer to Section 099113 "Exterior Painting" Section 099123 "Interior Painting" Section 099300 "Staining and Transparent Finishing" for final finishing of installed wood trim.

3.3 ADJUSTING AND CLEANING

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

MasterSpec

Self-Adhering Sheet Waterproofing System

PART 1 - GENERAL

1.1 SECTION INCLUDES:

Installation of sheet membrane waterproofing on surfaces indicated on drawings, consisting of preparation of existing and repaired concrete surfaces, sealing of cracks and joints, and application of CCW MiraDRI 860/861Sheet Membrane Waterproofing.

1.2 RELATED SECTIONS

- A. Section 031000 Concrete Accessories/Expansion Joints
- B. Section 033000 Cast-In-Place Concrete
- C. Section 042000 Unit Masonry
- D. Section 076000 Flashing and Sheet Metal
- E. Section 079000 Caulking and Sealants
- F. Section 079500 Expansion Control
- G. Section 220000 Plumbing
- H. Section 230000 Heating, Ventilating, and Air Conditioning (HVAC)
- I. Section 260000 Electrical

1.3 REFERENCES

- A. ASTM D 3767 Standard Practice for Rubber–Measurement of Dimensions
- B. ASTM D 412 Standard Test Method for Rubber Properties in Tension
- C. ASTM D 882 Standard Test Method for Tensile Properties of Thin Plastic Sheeting
- D. ASTM E 96 Standard Test Methods for Water Vapor Transmission of Materials
- E. ASTM D 1970 Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection
- F. ASTM C 836 Standard Specification for High Solids, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course
- G. ASTM D 903 Standard Test Method for Peel or Stripping Strength of Adhesive Bonds

- H. ASTM D 1876 Standard Test Method for Peel Release of Adhesives (T-Peel)
- I. ASTM E 154 Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover
- J. ASTM D 570 Standard Test Method for Water Absorption of Plastics
- K. ASTM D 5385 Standard Test Method for Hydrostatic Pressure Resistance of Waterproofing Membranes
- L. GSA-PBS 07121 Test for Decay from Soil Burial
- M. UL 790 Tests for Fire Resistance of Roof Covering Materials

1.4 SYSTEM DESCRIPTION

Product provided by this Section is a self-adhesive membrane of not less than 60 mils thickness, consisting of 56 mils of rubberized asphalt membrane laminated to a 4-mil cross-laminated polyethylene film.

1.5 SUBMITTALS

- A. General: Submit in accordance with Section 013000.
- B. Product Data: Submit manufacturer's product literature and installation instructions.
- C. Subcontractor's approval by Manufacturer: Submit document stating manufacturer's acceptance of subcontractor as an Approved Applicator for the specified materials.
- D. Warranty: Submit a sample warranty identifying the terms and conditions stated in Section 1.7.

1.6 QUALITY ASSURANCE

- A. Applicator Qualifications: Applicator shall have 5 years of experience in applying the same or similar materials and shall be specifically approved in writing by the membrane manufacturer.
- B. Regulatory Requirements: Comply with applicable codes, regulations, ordinances, and laws regarding use and application of products that contain volatile organic compounds (VOC).
- C. Pre-Application Conference: Prior to beginning work, convene a conference to review conditions, installation procedures, schedules and coordination with other work.

1.7 WARRANTY

- A. Upon completion and acceptance of the work required by this section, the manufacturer will issue a warranty agreeing to promptly replace defective materials installed by an approved applicator for a period of 5 years.
- B. The formation or presence of mold or fungi in a building is dependent upon a broad range of factors including, but not limited to, the presence of spores and nutrient sources, moisture, temperatures, climatic conditions, relative humidity, and heating/ventilating systems and their maintenance and operating capabilities. These factors are beyond the control of Carlisle and Carlisle shall not be responsible for any claims, repairs, restoration, or damages relating to the presence of any irritants, contaminants, vapors, fumes, molds, fungi, bacteria, spores, mycotoxins, or the like in any building or in the air, land, or water serving the building.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to project site in original, factory-sealed, unopened containers bearing manufacturer's name and label intact and legible with following information.
 - 1. Name of material.
 - 2. Manufacturer's stock number and date of manufacture.
 - 3. Material safety data sheet.
- B. Store materials in protected and well ventilated area. Protect from damage from sunlight, weather, excessive temperatures and construction operations. Remove damaged material from the site and dispose of in accordance with local applicable regulations.

1.9 PROJECT CONDITIONS

- A. Do not apply membrane when surface temperature is below or inclement weather conditions conflict with manufacturer's published requirements.
- B. Coordinate waterproofing work with other trades. The applicator shall have sole right of access to the specified areas for the time needed to complete the installation.
- C. Warn personnel against breathing of vapors and contact of material with skin or eyes. Wear applicable protective clothing and respiratory protection gear.
- D. Keep flammable products away from spark or flame. Do not allow the use of spark producing equipment during application and until all vapors have dissipated. Post "NO SMOKING" signs.
- E. Maintain work area in a neat and orderly condition, removing empty containers, rags, and rubbish daily from the site.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

Provide CCW MiraDRI 860/861 Sheet Membrane Waterproofing as manufactured by Carlisle Coatings and Waterproofing Incorporated, 900 Hensley Lane, Wylie, Texas 75098, Phone: (800) 527-7092 Fax: (972) 442-0076.

2.2 PRODUCTS

- A. Self-Adhesive Sheet Membrane Waterproofing: Shall be CCW MiraDRI 860/861consisting of a 56 mil rubberized-asphalt membrane laminated to 4 mil cross-laminated polyethylene film, and shall meet or exceed the following requirements:
 - 1. Thickness: 60 mils, ASTM D 3767
 - 2. Tensile Strength (Membrane): 325 psi, ASTM D 412
 - 3. Tensile Strength (Film): 5000 psi, ASTM D 882
 - 4. Elongation: 350% minimum, ASTM D 412
 - 5. Permeance: 0.05 Perm maximum, ASTM E 96
 - 6. Flexibility, 180° bend over 1 in. mandrel at -45°F: Unaffected, ASTM D 1970
 - 7. Crack Cycling at -25°F (100 cycles): Unaffected, ASTM C 836
 - 8. Peel Strength: 10.0 lb/in, ASTM D 903
 - 9. Lap Adhesion: 19.0 lb/in, ASTM D 1876
 - 10. Puncture Resistance: 60 lb, ASTM E 154
 - 11. Soil Burial 16 weeks: No Effect, GSA-PBS 07121
 - 12. Water Absorption: 0.1% by wt., ASTM D 570
 - 13. Hydrostatic Head: 230 ft., ASTM D 5385
- B. For application temperatures between 15°F and 60°F, use CCW 861-ULT Sheet Membrane and CCW-702, CCW-702LV, or CCW-715. For application temperatures above 40°F use CCW MiraDRI 860/861sheet membrane and CCW-702, CCW-702LV, CCW-702WB, CCW- 715, CCW-AWP, or Cav-Grip.

2.3 ACCESSORY PRODUCTS

- A. Surface Primer: Shallbe CCW-702, CCW-702LV, CCW-715, CCW-702WB, CCW-AWP or Cav- Grip.
- B. Mastic: Shall be CCW-704 Mastic.
- C. Sealants: Shall be CCW-703 Vertical Grade Liquiseal Membrane, CCW-LM-800XL, CCW-201 two-component Polyurethane Sealant or approved sealant by CCW.
- D. Backer Rod: Shall be closed-cell polyethylene foam rod.
- E. Protection Course: Shall be CCW-Protection Board-H or HS, CCW-300HV for horizontal surfaces or CCW-Protection Board-V or CCW-200V for vertical surfaces.

MasterSpec

- F. Drainage Composite: Shall be CCW MiraDRAIN as recommended by the manufacturer for each condition.
- G. Perimeter Drainage System: Where required shall be CCW MiraDRAIN HC.
- H. Swellable Sealant: Shall be MiraSTOP SS for use in non-moving joints to create watertight concrete joints and as an adhesive for CCW MiraSTOP waterstop strips
- I. Pre-formed Bentonite hydrophilic waterstop strip: Shall be CCW MiraSTOP BW for use in non-moving joints to create watertight concrete joints
- J. Pre-formed non-Bentonite hydrophilic waterstop strip: Shall be CCW MiraSTOP NBW for use in non-moving joints to create watertight concrete joints
- K. Injectable waterstop (grout tube): Shall be MiraSTOP IW for use as an injectable waterstop for use in non-moving joints to create watertight concrete joints
- L. Chemical grout: Shall be MiraSTOP CG-F and for use with the MiraSTOP IW
- M. Miscellaneous products: accessory products approved by Carlisle Coatings & Waterproofing Inc.

PART 3 - -EXECUTION

3.1 INSPECTION

A. Before any waterproofing work is started the waterproofing applicator shall thoroughly examine all surfaces for any deficiencies or unsatisfactory conditions detrimental to the proper completion of the work. Should any deficiencies exist, the architect, owner, or general contractor shall be notified in writing. Do not proceed with work until all deficiencies or unsatisfactory conditions are corrected.

3.2 SURFACE PREPARATION

- A. Refer to manufacturer's literature for requirements for preparation of substrates. Surfaces shall be structurally sound and free of voids, spalled areas, loose aggregate and sharp protrusions. Remove contaminants such as grease, oil and wax from exposed surfaces. Remove dust, dirt, loose stone and debris. Use repair materials and methods which are acceptable to manufacturer of sheet membrane waterproofing.
- B. Cast-In-Place Concrete Substrates:
 - 1. Do not proceed with installation until concrete has properly cured and dried (minimum 7 days for normal structural concrete and minimum 14 days for lightweight structuralconcrete).
 - 2. Concrete shall be cured by water curing method. Any curing compounds must be of the pure sodium silicate type or clear resin-based materials without waxes, oils or pigments and be approved by the Carlisle representative.

MasterSpec

- 3. Form release agents must not transfer to the concrete. Remove forms as soon as possible from below horizontal slabs to prevent entrapment of excess moisture. Excess moisture may lead to blistering of the membrane.
- 4. Concrete shall be sloped for proper drainage.
- 5. Voids, rock pockets and excessively rough surfaces shall be repaired with approved non- shrink grout or ground to match the unrepaired areas. Fill form tie rod holes with concrete and finish flush with surrounding surface.
- 6. Two-stage drains shall have a minimum 3 inch flange and be installed with the flange flush and level with the concrete surface.
- 7. Surfaces at cold joints shall be on the same plane. Grind irregular construction joints to suitable flush surface.
- C. Masonry Substrates: Apply CCW MiraDRI 860/861 waterproofing over concrete block with smooth trowel-cut mortar joints or rough surfaces prepared with a parge coat. Allow the parge coat to dry before priming and installing the CCW MiraDRI 860/861 waterproofing membrane.
- D. Wood Substrates: Apply CCW MiraDRI 860/861 waterproofing membrane over securely fastened sound surface. All joints and fasteners shall be flush to create a smooth surface.
- E. Related Materials: Treat joints and install flashing as recommended by waterproofing manufacturer.

3.3 APPLICATION

- A. Refer to manufacturer's literature for recommendations on installation, including but not limited to, the following:
 - 1. Apply primer/contact adhesive at rate recommended by manufacturer. Recoat areas which were not waterproofed the same day or if contaminated by dust. Mask and protect adjoining exposed finish surfaces to protect those surfaces from excessive application of primer.
 - 2. Do not install membrane until primer/contact adhesive is completely dry. Dry time will vary with weather conditions.
 - 3. Seal installation at the end of the day with troweled bead of CCW-LM-800XL or CCW- 703V Liquiseal.
 - 4. Apply protection board and/or MiraDRAIN and other related materials in accordance with manufacturer's recommendations.

3.4 INTEGRITYTESTING

- A. Test is required for all expanded warranties beyond the standard material warranty of horizontal applications.
- B. The test can be done with Electronic Vector Mapping or flood testing. Flood testing requires 2" minimum head of water for a period of 24 hours minimum.

3.5 PROTECTION COURSE

A. VERTICAL APPLICATION:

Install CCW MiraDRAIN HC Drainage System as the first course of drainage composite immediately after membrane has been installed on vertical surfaces. Install CCW MiraDRAIN Drainage Composite (consult CCW for recommendation), CCW-Protection Board-V or CCW- 200V on remainder. Stop drainage composite 6" below final grade level.

B. HORIZONTAL APPLICATION:

Install CCW MiraDRAIN Drainage Composite (consult CCW for recommendation) or CCW- Protection Board-H or HS or CCW 300HV immediately after flood testing on horizontal surfaces. If flood testing is delayed, install a temporary covering to protect the CCW MiraDRI 860/861membrane from damage by other trades.

End of Section

Liquiseal, MiraDRAIN, MiraDRI and MiraSTOP are registered trademarks of Carlisle. Carlisle Coatings and Waterproofing Incorporated, 900 Hensley Lane, Wylie, TX 75098 (800) 527-7092

http://www.carlisleccw.com

SECTION 071900 - WATER REPELLENTS

1.1 SUMMARY

- A. Water-repellent treatments for the following:
 - 1. Cast-in-place concrete.
 - 2. Precast concrete.
 - 3. Concrete unit masonry.

1.2 QUALITY ASSURANCE

A. Mockups for each type and color of water repellent and substrate indicated.

1.3 PRECONSTRUCTION TESTING

A. Preconstruction Testing: Performed on field mockups manufacturer's standard substrate assemblies existing substrate assemblies.

1.4 MATERIALS

- A. Penetrating Water Repellent: Silane Siloxane Silane/siloxane blend Siliconate Proprietary blend, clear.
 - 1. VOC Content: 600 g/L 400 g/L or less.
- B. Film-Forming Water Repellent: Silicone-resin sealer, clear Proprietary blend, clear Proprietary blend, pigmented Acrylic, clear Acrylic, pigmented.
 - 1. VOC Content: 600 g/L 400 g/L or less.
- C. MPI #34 (paintable) water repellent, clear.
 - 1. MPI Green Performance Standard: GPS-1 GPS-2.
- D. MPI #117 (not paintable) water repellent, clear.
 - 1. MPI Green Performance Standard: GPS-1 GPS-2.

1.5 APPLICATION

A. Manufacturer's Field Service: Factory-authorized service representative to inspect substrate and instruct Applicator.

1.6 FIELD QUALITY CONTROL

A. Coverage testing by hosing down surfaces.

SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Extruded polystyrene foam-plastic board.
 - 2. Glass-fiber blanket.
 - 3. Spray-applied cellulosic insulation.
- B. Related Requirements:
 - 1. Section 075423 "Thermoplastic-Polyolefin (TPO) Roofing" for insulation specified as part of roofing construction.
 - 2. Section 092900 "Gypsum Board" for sound attenuation blanket used as acoustic insulation.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- 1.4 INFORMATIONAL SUBMITTALS
 - A. Product Test Reports: For each product, for tests performed by a qualified testing agency.
 - B. Evaluation Reports: For foam-plastic insulation, from ICC-ES.
- 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 EXTRUDED POLYSTYRENE FOAM-PLASTIC BOARD

- A. Extruded Polystyrene Board, Type X : ASTM C 578, Type X, 15-psi minimum compressive strength; unfaced; maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E 84.
 - 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. DiversiFoam Products.
 - b. Dow Chemical Company (The).
 - c. Owens Corning.
 - d. Insulfoam, a Carlisle Company
 - 2. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
- B. Extruded Polystyrene Board, Type IV : ASTM C 578, Type IV, 25-psi minimum compressive strength; unfaced; maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E 84.
 - 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. DiversiFoam Products.
 - b. Dow Chemical Company (The).
 - c. Owens Corning.
 - d. Insert manufacturer's name.Insulfoam, a Carlisle Company
 - 2. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
- C. Extruded Polystyrene Board, Type IV, Drainage Panels: ASTM C 578, Type IV, 25-psi minimum compressive strength; unfaced; maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E 84; fabricated with shiplap or channel edges and with one side having grooved drainage channels.

- 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. DiversiFoam Products.
 - b. Dow Chemical Company (The).
 - c. Owens Corning.
 - d. Insulfoam, a Carlisle Company
- D. Extruded Polystyrene Board, Type VI: ASTM C 578, Type VI, 40-psi minimum compressive strength; maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E 84.
 - 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. DiversiFoam Products.
 - b. Dow Chemical Company (The).
 - c. Owens Corning.
 - d. Soprema, Inc.
 - e. Insulfoam, a Carlisle Company.
- E. Extruded Polystyrene Board, Type VI, Drainage Panels: ASTM C 578, Type VI, 40-psi minimum compressive strength; unfaced; maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E 84; fabricated with shiplap or channel edges and with one side having grooved drainage channels.
 - 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. DiversiFoam Products.
 - b. Dow Chemical Company (The).
 - c. Kingspan Insulation Limited.
 - d. Owens Corning.
 - e. Insulfoam, a Carlisle Company.
- F. Extruded Polystyrene Board, Type VII: ASTM C 578, Type VII, 60-psi minimum compressive strength; maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E 84.
 - 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. DiversiFoam Products.
 - b. Dow Chemical Company (The).
 - c. Insulfoam, a Carlisle Company.

- G. Extruded Polystyrene Board, Type VII, Drainage Panels: ASTM C 578, Type VII, 60-psi minimum compressive strength; maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E 84; fabricated with shiplap or channel edges and with one side having grooved drainage channels.
 - 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. DiversiFoam Products.
 - b. Dow Chemical Company (The).
 - c. Owens Corning.
 - d. Insulfoam, a Carlisle Company.
- H. Extruded Polystyrene Board, Type V: ASTM C 578, Type V, 100-psi minimum compressive strength; maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E 84.
 - 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. Dow Chemical Company (The).
 - b. Owens Corning.
 - c. Insulfoam, a Carlisle Company.

2.2 GLASS-FIBER BLANKET

- A. Glass-Fiber Blanket, Unfaced : ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
 - 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. Johns Manville; a Berkshire Hathaway company.
 - c. Owens Corning.

2.3 SPRAY-APPLIED CELLULOSIC INSULATION

A. Self-Supported, Spray-Applied Cellulosic Insulation : ASTM C 1149, Type I (materials applied with liquid adhesive; suitable for either exposed or enclosed applications), Type II (materials containing a dry adhesive activated by water during installation; intended only for enclosed or covered applications), chemically treated for flame-resistance, processing, and handling characteristics.

- 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. Central Fiber LLC.
 - b. GreenFiber.
 - c. Hamilton Manufacturing Inc.
 - d. International Cellulose Corp.
 - e. Nu-Wool Co., Inc.

2.4 INSULATION FASTENERS

- A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position with self-locking washer in place.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. AGM Industries, Inc.
 - b. Gemco.
 - c. Insert manufacturer's name.
 - 2. Plate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
 - 3. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch in diameter; length to suit depth of insulation.
- B. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- 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 square or in diameter.
 - 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. AGM Industries, Inc.
 - b. Gemco.
 - 2. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in the following locations:
 - a. Crawl spaces.
 - b. Ceiling plenums.
 - c. Attic spaces.
- C. Insulation Standoff: Spacer fabricated from galvanized mild-steel sheet for fitting over spindle of insulation anchor to maintain air space as shown on drawings, between face of insulation and substrate to which anchor is attached.

- 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. Gemco.
- D. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates without damaging insulation, fasteners, or substrates.
 - 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. AGM Industries, Inc.
 - b. Gemco.

2.5 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 vapor retarders, or that interfere with insulation attachment.
- 3.2 INSTALLATION, GENERAL
 - A. Comply with insulation manufacturer's written instructions applicable to products and applications.
 - B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

- C. 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 SLAB INSULATION

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

3.4 INSTALLATION OF FOUNDATION WALL INSULATION

- A. Butt panels together for tight fit.
- B. Anchor Installation: Install board insulation on concrete substrates by adhesively attached, spindle-type insulation anchors as follows:
 - 1. Fasten insulation anchors to concrete substrates with insulation anchor adhesive according to anchor manufacturer's written instructions. 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.

3.5 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

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

THERMAL INSULATION

- 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
- 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
- 3. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
- 4. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
- 5. For wood-framed construction, install blankets according to ASTM C 1320 and as follows:
 - a. With faced blankets having stapling flanges, lap blanket flange over flange of adjacent blanket to maintain continuity of vapor retarder once finish material is installed over it.
- 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..
 - 2. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.
- C. Spray-Applied Cellulosic Insulation: Apply spray-applied insulation according to manufacturer's written instructions. Do not apply insulation until installation of pipes, ducts, conduits, wiring, and electrical outlets in walls is completed and windows, electrical boxes, and other items not indicated to receive insulation are masked. After insulation is applied, make flush with face of studs by using method recommended by insulation manufacturer.

3.6 PROTECTION

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

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. Weather Barrier Membrane (DuPontTyvek®DrainWrap)
 - 2. Seam Tape (DuPont Tyvek® Tape)
 - 3. Self-Adhered Flashing (DuPont FlexWrap NF, DuPont TM FlexWrap TM EZ, DuPont StraightFlash, DuPont StraightFlash VF, and/or DuPontTM Flashing Tape)
 - 4. Weather Barrier Accessories Fasteners (DuPont Tyvek® Wrap Caps)
- B. Related Requirements:
 - 1. Section 047300 "Simulated Masonry" for stone masonry ties and flashing installation.
 - 2. Section 072100 "Thermal Insulation" for installation of exterior insulation.
 - 3. Section 074646 "Fiber-Cement Siding" for installation of fiber-cement board siding.

1.3 REFERENCES

- A. ASTM International
 - 1. ASTM C920; Standard Specification for Elastomeric Joint Sealants
 - 2. ASTM C1193; Standard Guide for Use of Joint Sealants
 - 3. ASTM D882; Test Method for Tensile Properties of Thin Plastic Sheeting
 - 4. ASTM D1117; Standard Guide for Evaluating Non-woven Fabrics
 - 5. ASTM E84; Test Method for Surface Burning Characteristics of Building Materials
 - 6. ASTM E96; Test Method for Water Vapor Transmission of Materials
 - 7. ASTM E1677; Specification for Air Barrier Material or System for Low-Rise Framed Building Walls
 - 8. ASTM E2178; Test Method for Air Permeance of Building Materials
 - 9. ASTM E2273; Standard Test Method for Determining the Drainage Efficiency of Exterior Insulation and Finish Systems (EIFS) Clad Wall Assemblies
- B. AATCC Ó American Association of Textile Chemists and Colorists
 - 1. Test Method 127 Water Resistance: Hydrostatic Pressure Test

- C. TAPPI
 - 1. Test Method T-410; Grams of Paper and Paperboard (Weight per Unit Area)
 - 2. Test Method T-460; Air Resistance (Gurley Hill Method)

1.4 ACTION SUBMITTALS

- A. Refer to Section 013300 Submittal Procedures
- B. Product Data: Submit manufacturer current technical literature for each component.
 - 1. For weather barrier, include data on air and water-vapor permeance based on testing in accordance with referenced standards.
 - 2. Test Reports: Envelope testing and verification of the following:
 - a. Water-Spray Test.
 - b. Air Infiltration Test.
 - c. Water Penetration Test.
- C. Shop Drawings: Show details of weather barrier at terminations, openings, and penetrations. Show details of flexible flashing applications.

1.5 INFORMATIONAL SUBMITTALS

- A. Evaluation Report: For weather barrier, from ICC-ES.
- B. Manufacturer's Instructions: For installation of each product specified.
- C. Samples: Weather Barrier membrane, minimum 8-1/2 inches by 11 inch.
- D. Qualification Data: For Installer
- E. Sample Warranty: For manufacturer's warranty.
- F. Reports: Field test and inspection reports.
- G. Installer's weather barrier manufacturer-training certificate.
- H. Closeout Submittals
 - 1. Refer to Section 017800 Closeout Submittals

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified firm that is certified by weather barrier system manufacturer to install manufacturer's product in accordance with manufacturer¢s installation guidelines and recommendations.
- B. Mockups: Build mockups to set quality standards for materials and execution.

WEATHER RESISTIVE BARRIER

- 1. Build integrated mockups of exterior wall assembly 150 sq. ft. incorporating backup wall construction, external cladding, window, storefront, door frame and sill, insulation, ties and other penetrations, and flashing to demonstrate surface preparation, crack and joint treatment, application of weather barriers, and sealing of gaps, terminations, and penetrations of air-barrier assembly.
 - a. Include junction with roofing membrane [building corner condition,] [fenestration and wall interface].
 - b. If Architect determines mockups do not comply with requirements, reconstruct mockups and apply weather barrier until mockups are approved.
- 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
- C. Manufacturer's Field Service: Register project with weather barrier manufacturer prior to installation of weather barrier and comply with weather barrier manufacturer's Project registration and observation process.
- D. Source Limitations: Provide weather barrier and accessory materials produced by single manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Refer to Section [01 60 00 Product Requirements]
- B. Deliver weather barrier materials and components in manufacturer¢s original, unopened, undamaged containers with identification labels intact.
- C. Store weather barrier materials as recommended by system manufacturer. Do not store near heat source or open flame.

1.8 WARRANTY

- A. Manufacturer's Product and Labor Warranty: Manufacturer agrees to repair or replace weather barrier that fails in materials within specified warranty period, including removal and replacement of affected construction up to manufacturer¢s limits when all terms of Warranty are met.
 - 1. Warranty Period: 10 years from date of purchase.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- DuPont Performance Building Solutions; 200 Powder Mill Road, DuPont Experimental Station 356
 Wilmington, Delaware 19803; 1-800-448-9835; building.dupont.com
- B. Requests for approval of equal substitutions will be considered in accordance with provisions of Section 01600.

2.2 PERFORMANCE REQUIREMENTS

A. General Performance: Installed weather barrier and accessories shall withstand specified wind pressures, liquid water penetration, and water vapor pressures, without failure due to defective manufacture of products.

2.3 WEATHER BARRIER

- A. Basis of Design: spunbonded polyolefin, non-woven, non-perforated, weather barrier is based upon DuPont Tyvek® DrainWrap and related assembly components.
- B. Performance Characteristics:
 - 1. Air Penetration Resistance: <0.004 cfm/ft² at 1.57 psf, when tested in accordance with ASTM E2178. Type I per ASTM E1677.
 - 2. Type I Air Barrier Material when tested in accordance with ASTM E1677.
 - 3. Water Vapor Transmission: 50 perms, when tested in accordance with ASTM E96-05, Method B.
 - 4. Water Penetration Resistance: 210 cm when tested in accordance with AATCC Test Method 127.
 - 5. Basis Weight: 2.1 oz/yd², when tested in accordance with TAPPI Test Method T-410.
 - 6. Air Resistance: >300 seconds, when tested in accordance with TAPPI Test Method T-460.
 - 7. Tensile Strength: 30/30 lbs/in., when tested in accordance with ASTM D882, Method A.
 - 8. Tear Resistance: 7/9 lbs, when tested in accordance with ASTM D1117.
 - 9. Surface Burning Characteristics: Class A, when tested in accordance with ASTM E84. Flame Spread: 5, Smoke Developed: 25.
 - 10. Drainage Efficiency: >98%, when tested in accordance with ASTM E2273.

2.4 WEATHER BARRIER FLASHING

A. Strip Flashing: Composite flashing material composed of spunbonded polyethylene laminate with 100 percent butyl-based, adhesive layer; AAMA 711, Class A (no primer), Level 3 thermal exposure, 176 deg F for 7 days.

WEATHER RESISTIVE BARRIER
- 1. Basis-of-Design Product: Subject to compliance with requirements, provide DuPont Safety & Construction: DuPont de Nemours, Inc.; DuPont StraightFlash or comparable product by one of the following:
 - a. Tamlyn
 - b. Barricade Building Products
 - c. Kimberly-Clark
- 2. Water Penetration: No leakage at 15 psf(720 per ASTM E 331.
- 3. Low Temperature Adhesion: Exceeds minimum value of 1.5 lb./in. at 25 deg F as Class A without primer use.
- 4. Adhesion After Water Immersion: Exceeds minimum value of 1.5 lb./in., after AAMA 800, Sections 2.4.1.3.1/2.4.1.4.3, Test B.
- B. Strip Flashing: Composite flashing material composed of polypropylene laminate with 100 percent butyl-based, adhesive layer; AAMA 711, Class A (no primer), Level 3 thermal exposure, 176 deg F for 7 days.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide DuPont Safety & Construction: DuPont de Nemours, Inc.; DuPont Flashing Tape or comparable product by one of the following:
 - a. Tamlyn
 - b. Barricade Building Products
 - c. Kimberly-Clark
 - 2. Water Penetration: No leakage at 6.24 psf(300 per ASTM E 331.
 - 3. Low Temperature Adhesion: Exceeds minimum value of 1.5 lb./in. at 25 deg F as Class A without primer use.

2.5 WEATHER BARRIER ACCESSORIES

- A. Building Wrap Seam Tape: 3 inch wide, Pressure-sensitive plastic tape recommended by weather barrier manufacturer for sealing joints and penetrations in building wrap.
 - 1. Basis-of-Design Product: DuPont Safety & Construction: DuPont de Nemours, Inc.; Tyvek® Tape.
- B. Fasteners with Self-Gasketing Washers: Building wrap manufacturer's recommended pneumatically or hand-applied fasteners with [1-inch-] diameter, high-density polyethylene cap washers with UV inhibitors.
 - 1. Basis-of-Design Product: DuPont Safety & Construction: DuPont de Nemours, Inc.; DuPont Tyvek[®] Wrap Caps.
- C. Sealants
 - 1. Refer to Section 079200 Joint Sealants
 - 2. Provide sealants that comply with ASTM C 920, elastomeric polymer sealant to maintain watertight conditions.
 - 3. Products:

- a. DuPont Residential Sealant
- b. Sealants recommended by the weather barrier manufacturer
- D. Primer for Flashings: Synthetic rubber-based product; spray applied. Strengthen adhesive bond at low temperature applications between weather products such as self-adhered flashing products, commercial building wraps, and common building sheathing materials.
 - 1. Basis-of-Design Product: DuPont Safety & Construction: DuPont de Nemours, Inc., DuPont Adhesive/Primer.
 - 2. Peel Adhesion Test: Passes in accordance with ASTM D 3330, Test Method F, for the following.
 - a. Peel Angles: 0, 25, 72, and 180 degrees.
 - b. Substrates: Concrete masonry units (CMU), exterior gypsum sheathing, oriented strand board (OSB), aluminum, and vinyl.
 - 3. Chemical Compatibility: Pass; AAMA 713.
 - 4. Flame Spread Index: 5; ASTM E 84.
 - 5. Smoke Development Index: 0; ASTM E 84.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements.
- B. Verify that substrate and surface conditions are in accordance with commercial weather barrier manufacturer recommendations prior to installation.
 - 1. Verify that rough sill framing for doors and windows is sloped downwards towards the exterior and is level across width of the opening.
- C. Verify that surfaces to receive weather barrier flashing are clean, dry, and free of frost.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Direct water onto an acceptable weather barrier drainage plane with an unobstructed path to exterior of wall.
 - 1. Provide a drainage path for water intrusion through window and door attachment system that collects at window and door sills and directs water to the exterior or weather barrier.

3.3 WEATHER BARRIER INSTALLATION

- A. General: Comply with weather barrier manufacturer's written instructions and warranty requirements.
- B. Cover exposed exterior surface of sheathing with weather barrier securely fastened to structure per manufacturer¢s written instructions immediately after sheathing is installed.
 - 1. Maintain continuity of air and water barrier assemblies.
 - 2. Start weather barrier installation at a building corner, leaving 12 inches of weather barrier extended beyond corner to overlap.
 - 3. Install weather barrier horizontally starting at lower portion of wall surface. Extend bottom roll edge over sill plate 1•minimum. For air barrier installations, seal weather barrier along bottom edge with sealant or tape. Shingle weather barrier over back edge of through-wall flashings and seal weather barrier with building wrap tape. Ensure weeps are not blocked.
 - 4. Provide minimum 6 inches overlap at horizontal- and vertical-wrap seams in a shingle manner to maintain continuous downward drainage plane and air and water barrier.
- C. Seams: Seal seams with building wrap tape per manufacturer's recommended installation instructions.
 - 1. Shiplap horizontal seams in weather barrier to facilitate proper drainage.
- D. Fasteners: Use weather barrier manufacturer¢s recommended fasteners to secure weather barrier and install fasteners according weather barrier manufacturer¢s installation guidelines.
 - 1. Do not use temporary fasteners to permanently attach weather barrier.
 - 2. Do not place fasteners with gasketing washers where weather barrier flashing will be installed.
 - 3. Install fasteners with gasketing washers through flashing where recommended by manufacturer.
- E. Openings:
 - 1. Provide head flaps and seam overlaps to maintain continuous drainage.
 - 2. Repair damage to weather barrier using method recommended by weather barrier manufacturer.
 - 3. Install flashing according to weather barrier manufacturer's installation guidelines.

3.4 WEATHER BARRIER FLASHING

A. Installation: Remove wrinkles and bubbles, reposition weather barrier as necessary to produce a uniform, smooth surface.

MasterSpec

- 1. Ensure that ambient and substrate surface temperatures are acceptable in accordance with manufacturer instructions and recommendations.
- 2. Wipe surfaces to remove moisture, dirt, grease and other debris that could interfere with adhesion.
- 3. Apply weather barrier manufacturer¢s recommended primer over concrete, masonry, and glass-mat gypsum wall sheathing substrates to receive weather barrier flashing.
- 4. Lap weather barrier flashing a minimum of 2 inches onto weather barrier.
- 5. Apply pressure over entire surface using roller or firm hand pressure
- B. Rough Openings: Shiplap flashing with weather barrier in a shingle manner to maintain a continuous downward drainage plane and air and water barrier in accordance with manufacturer¢s written instructions.
 - 1. Apply [9-inch-] wide conformable weather barrier flashing at door and window sills.
 - 2. Ensure that sill flashing does not slope to the interior.
 - 3. Install backer rod in joint between frame of opening product and flashed rough opening on the interior.
 - 4. Apply sealant or closed-cell polyurethane foam insulation around entire opening/fenestration product to create air seal around interior perimeter of window openings in accordance with weather barrier manufacturer¢s instructions.
 - 5. Around door and window openings, apply butyl-based flashing to flaps of weather barrier per manufacturer¢s instructions.
 - 6. Seal building wrap head flap of the windows.
- C. Penetrations: Seal weather barrier around each penetration with weather barrier manufacturer's recommended self-adhered flashing product. Integrate products with flanges into the weather barrier.
- D. Terminations: Provide minimum 2 inches overlap using strip flashing on adjoining roof and base of wall systems to maintain continuous downward drainage plane.
 - 1. Secure weather barrier with fasteners and weather-barrier flashing.
- E. Flashing Patches: Apply weather barrier manufacturer's recommended weather barrier flashing patches behind fastening plates, such as brick-tie base plates, metal-flashing clips, and metal channels.

3.5 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to train installers and observe subject test-wall areas and installations.
- B. Testing Agency: engage a qualified third-party testing agency to perform tests and inspections.
 - 1. Water Penetration: ASTM E 1105 as specified by Testing Agency. No water penetration shall occur as defined in ASTM E 1105.

a. Perform specified number of tests in each test area and at various stages of completion as directed by Architect.

3.6 CLEANING

A. Immediately remove release paper and scrap from work area and dispose of material in accordance with requirements of [Section 017300 "Execution" and Section 017419 "Construction Waste Management and Disposal."]

3.7 PROTECTION

- A. Protect installed weather barrier from the following:
 - 1. Damage from cladding, structure, or a component of the structure (e.g., window, door, or wall system).
 - 2. Contamination from building site chemicals, premature deterioration of building materials, or nonstandard use or application of products.
 - 3. Foreign objects or agents, including the use of materials incompatible with weather barrier products.
 - 4. UV exposure in excess of products' stated limits.

END OF SECTION

SECTION 072600 - VAPOR RETARDERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Polyethylene vapor retarders.
- B. Related Requirements:
 - 1. Section 033000 "Cast-in-Place Concrete" for under-slab vapor retarders.
 - 2. Section 072100 "Thermal Insulation" for vapor retarders integral with insulation products.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each product, for tests performed by a qualified testing agency.

PART 2 - PRODUCTS

2.1 POLYETHYLENE VAPOR RETARDERS

A. Polyethylene Vapor Retarders: ASTM D 4397, 10-mil- thick sheet, with maximum permeance rating of 0.1 perm.

2.2 ACCESSORIES

A. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.

- B. Adhesive for Vapor Retarders: Product recommended by vapor-retarder manufacturer and has demonstrated capability to bond vapor retarders securely to substrates indicated.
- C. Vapor-Retarder Fasteners: Pancake-head, self-tapping steel drill screws; with fender washers.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean substrates of substances that are harmful to vapor retarders, including removing projections capable of puncturing vapor retarders.

3.2 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.

3.3 PROTECTION

A. Protect vapor retarders from damage until concealed by permanent construction.

END OF SECTION 072600

SECTION 073113 - 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. Glass-fiber-reinforced asphalt shingles.
- B. Related Requirements:
 - 1. Section 077200 "Roof Accessories" for roof ventilators.

1.3 ALTERNATES

A. See Section 012300 "Alternates" for description of alternates affecting items specified under this Section.

1.4 DEFINITIONS

- A. Roofing Terminology: See ASTM D1079 for definitions of terms related to roofing Work in this Section.
- 1.5 ACTION SUBMITTALS
 - A. Product Data: For the following:
 - 1. Asphalt shingles.
 - B. Shop Drawings: For metal flashing and trim.
 - C. Samples: For each exposed product and for each color and blend specified, in sizes indicated.
 - 1. Asphalt Shingles: Full size.
 - D. Samples for Initial Selection:
 - 1. For each type of asphalt shingle indicated.

ASPHALT SHINGLES

- 2. For each type of accessory involving color selection.
- 1.6 INFORMATIONAL SUBMITTALS
 - A. Qualification Data: For Installer.
 - B. Product Test Reports: For each type of asphalt shingle and underlayment product indicated, for tests performed by a qualified testing agency.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For asphalt shingles to include in maintenance manuals.
- B. Materials warranties.

1.8 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. Asphalt Shingles: 100 sq. ft. of each type and in each color and blend, in unbroken bundles.

1.9 QUALITY ASSURANCE

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

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Store roofing materials in a dry, well-ventilated location protected from weather, sunlight, and moisture in accordance with 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.

1.11 FIELD CONDITIONS

- A. Environmental Limitations: Proceed with installation only when existing and forecasted weather conditions permit product installation and related Work to be performed in accordance with manufacturer's written instructions and warranty requirements.
 - 1. Install self-adhering, polymer-modified bitumen sheet underlayment within the range of ambient and substrate temperatures recommended in writing by manufacturer.

1.12 WARRANTY

- A. Materials 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. Materials Warranty Period: 25 years from date of Substantial Completion, prorated, with first five years nonprorated.
 - 3. Wind-Speed Warranty Period: Asphalt shingles will resist blow-off or damage caused by wind speeds of up to 60 mph for 15 years from date of Substantial Completion.
 - 4. Algae-Resistance Warranty Period: Asphalt shingles will not discolor for 20 years from date of Substantial Completion.
 - 5. Workmanship Warranty Period: 20 years from date of Substantial Completion.
- B. Roofing Installer's Warranty: On warranty form at end of this Section, 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: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

- 2.1 SOURCE LIMITATIONS
 - A. Obtain each type of product from single source from single manufacturer.

2.2 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 in accordance with 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. Wind Resistance: Provide asphalt shingles that comply with requirements of ASTM D3161/D3161M, Class F, and with ASTM D7158/D7158M, Class H.
- C. Energy Performance, ENERGY STAR: Provide asphalt shingles that are listed on the DOE's "ENERGY STAR Roof Product List" for steep-slope roof products.

2.3 GLASS-FIBER-REINFORCED ASPHALT SHINGLES

- A. Impact-Resistant, Laminated-Strip Asphalt Shingles: ASTM D3462/D3462M, laminated, multi-ply overlay construction; glass-fiber reinforced, mineral-granule surfaced, and self-sealing; with impact resistance complying with UL 2218, Class 4.
 - 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. Atlas EPS; a Division of Atlas Roofing Corporation.
 - b. CertainTeed Corporation.
 - c. GAF.
 - 2. Butt Edge: Straight cut.
 - 3. Strip Size: Manufacturer's standard.
 - 4. Algae Resistance: Granules resist algae discoloration.
 - 5. Color and Blends: Black, non-blended as selected by Architect from manufacturer's full range.

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.
- 3. Verify that vent stacks and other penetrations through roofing are installed and securely fastened.
- 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 INSTALLATION OF ASPHALT SHINGLES

- A. Install asphalt shingles in accordance with manufacturer's written instructions 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 with tabs removed 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 laminated asphalt shingles stair-stepping diagonally across roof deck with manufacturer's recommended offset pattern at succeeding courses, maintaining uniform exposure.
- D. Fasten asphalt shingle strips with a minimum of four roofing nails, but not less than the number indicated in manufacturer's written instructions for roof slope and design wind speed indicated on Drawings and for warranty requirements specified in this Section.
 - 1. Locate fasteners in accordance with manufacturer's written instructions.
 - 2. Where roof slope exceeds 18:12, hand seal self-sealing asphalt shingles to improve the shingles' positive bond by applying asphalt roofing cement spots between course overlaps after nailing the upper course.
 - 3. Where roof slope is less than 4:12, hand seal self-sealing asphalt shingles to improve the shingles' positive bond by applying asphalt roofing cement spots between course overlaps after nailing the upper course.
 - 4. When ambient temperature during installation is below 50 deg F, hand seal self-sealing asphalt shingles by applying asphalt roofing cement spots between course overlaps after nailing the upper course.
- E. Open Valleys: Cut and fit asphalt shingles at open valleys, trimming upper concealed corners of shingle strips.
 - 1. Maintain uniform width of exposed open valley from highest to lowest point.
 - 2. Extend shingle a minimum of 4 inches over valley metal.
 - 3. Set valley edge of asphalt shingles in a 3-inch- wide bed of asphalt roofing cement.

4. Do not nail asphalt shingles to metal open-valley flashings.

END OF SECTION 073113

SECTION 074113.16 - STANDING-SEAM METAL ROOF PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Standing-seam metal roof panels.
- B. Related Sections:
 - 1. Section 077253 "Snow Guards" for prefabricated devices designed to hold snow on the roof surface, allowing it to melt and drain off slowly.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.
- B. Shop Drawings:
 - 1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
 - 2. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches.
- C. Samples for Initial Selection: For each type of metal panel indicated with factory-applied color finishes.
 - 1. Include similar Samples of trim and accessories involving color selection.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Sample Warranties: For special warranties.

STANDING-SEAM METAL ROOF PANELS

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal panels to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. UL-Certified, Portable Roll-Forming Equipment: UL-certified, portable roll-forming equipment capable of producing metal panels warranted by manufacturer to be the same as factory-formed products. Maintain UL certification of portable roll-forming equipment for duration of work.
- C. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
 - 1. Build mockup of typical roof area and eave, including fascia, as shown on Drawings; approximately 48 inches square by full thickness, including attachments, underlayment, and accessories.
 - 2. Build mockups for typical roof area only, including accessories.
 - a. Size: 12 feet long by 6 feet.
 - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.
- B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Retain strippable protective covering on metal panels during installation.

1.8 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

1.9 COORDINATION

- A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.
- B. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.10 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including rupturing, cracking, or puncturing.
 - b. Deterioration of metals and other materials beyond normal weathering.
 - 2. Warranty Period: Two years from date of Substantial Completion.
- B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 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: 20 years from date of Substantial Completion.
- C. Special Weathertightness Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that fail to remain weathertight, including leaks, within specified warranty period.
 - 1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than <Insert value> percent.
- B. Energy Performance: Provide roof panels that are listed on the EPA/DOE's ENERGY STAR "Roof Product List" for low -slope roof products.
- C. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E1592:
 - 1. Wind Loads: As indicated on Structural Drawings.
 - 2. Deflection Limits: For wind loads, no greater than 1/180 of the span.
- D. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. when tested according to ASTM E1680[or ASTM E283] at the following test-pressure difference:
 - 1. Test-Pressure Difference: 1.57 lbf/sq. ft..
- E. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E1646[or ASTM E331] at the following test-pressure difference:
 - 1. Test-Pressure Difference: 2.86 lbf/sq. ft..
- F. Hydrostatic-Head Resistance: No water penetration when tested according to ASTM E2140.
- G. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.
 - 1. Uplift Rating: UL 30.
- H. FM Global Listing: Provide metal roof panels and component materials that comply with requirements in FM Global 4471 as part of a panel roofing system and that are listed in FM Global's "Approval Guide" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Global markings.
 - 1. Fire/Windstorm Classification: Class 1A-60.
 - 2. Hail Resistance: MH.
- I. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

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

2.2 STANDING-SEAM METAL ROOF PANELS

- A. Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports using concealed clips in side laps. Include clips, cleats, pressure plates, and accessories required for weathertight installation.
 - 1. Aluminum Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E1637.
- B. Vertical-Rib, Seamed-Joint, Standing-Seam Metal Roof Panels <Insert drawing designation>: Formed with vertical ribs at panel edges and a flat pan between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels, engaging opposite edge of adjacent panels, and mechanically seaming panels together.
 - 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. ATAS International, Inc.
 - b. Englert, Inc.
 - c. Fabral.
 - d. Morin A Kingspan Group Company.
 - e. PAC-CLAD; Petersen Aluminum Corporation.
 - 2. Aluminum Sheet: Coil-coated sheet, ASTM B209, alloy as standard with manufacturer, with temper as required to suit forming operations and structural performance required.
 - a. Thickness: 0.040 inch.
 - b. Surface: Smooth, flat finish.
 - c. Exterior Finish: Two-coat fluoropolymer.
 - d. Color: Black, as selected by Architect from manufacturer's full range. .
 - 3. Joint Type: As standard with manufacturer.
 - 4. Panel Coverage: 18 inches.
 - 5. Panel Height: 2.0 inches.

2.3 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Underlayment: Provide self-adhering, cold-applied, sheet underlayment, a minimum of 30 mils thick, consisting of slip-resistant, polyethylene-film top surface laminated to a layer of butyl or SBS-modified asphalt adhesive, with release-paper backing. Provide primer when recommended by underlayment manufacturer.

- 1. Thermal Stability: Stable after testing at 240 deg F; ASTM D1970.
- 2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F; ASTM D1970.
- 3. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Carlisle Residential; a division of Carlisle Construction Materials; WIP 300HT.
 - b. Grace Construction Products; W.R. Grace & Co. -- Conn.; Grace Ice and Water Shield HT.
 - c. Owens Corning; WeatherLock Metal High Temperature Underlayment.
- B. Felt Underlayment: ASTM D226/D226M, Type II (No. 30), asphalt-saturated organic felts.

2.4 MISCELLANEOUS MATERIALS

- A. Miscellaneous Metal Subframing and Furring: ASTM C645; cold-formed, metallic-coated steel sheet, ASTM A653/A653M, G90 coating designation or ASTM A792/A792M, Class AZ50 coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.
- B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.
 - 1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal panels.
 - 2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
 - 3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.

- D. Gutters: Formed from same material as roof panels, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum 96-inch- long sections, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual." Furnish gutter supports spaced a maximum of 36 inches o.c., fabricated from same metal as gutters. Provide wire ball strainers of compatible metal at outlets. Finish gutters to match metal roof panels roof fascia and rake trim.
- E. Downspouts: Formed from same material as roof panels. Fabricate in 10-foot- long sections, complete with formed elbows and offsets, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual." Finish downspouts to match gutters.
- F. Panel Fasteners: Self-tapping screws designed to withstand design loads.
- G. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.
 - 1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.
 - 2. Joint Sealant: ASTM C920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.
 - 3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C1311.

2.5 FABRICATION

- A. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.
- B. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- C. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.
- D. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.
 - 1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.

- 2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
- 3. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
- 4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
- 5. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.
 - a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal panel manufacturer for application, but not less than thickness of metal being secured.

2.6 FINISHES

- A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are unacceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Aluminum Panels and Accessories:
 - 1. Two-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions[for seacoast and severe environments].

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.
 - 1. Examine primary and secondary roof framing to verify that rafters, purlins, angles, channels, and other structural panel support members and anchorages have been installed within alignment tolerances required by metal roof panel manufacturer.
 - 2. Examine solid roof sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal roof panel manufacturer.

- a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

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

3.3 INSTALLATION OF UNDERLAYMENT

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

3.4 INSTALLATION OF STANDING SEAM METAL ROOF PANELS

- A. Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
 - 1. Shim or otherwise plumb substrates receiving metal panels.
 - 2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
 - 3. Install screw fasteners in predrilled holes.
 - 4. Locate and space fastenings in uniform vertical and horizontal alignment.
 - 5. Install flashing and trim as metal panel work proceeds.
 - 6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
 - 7. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
 - 8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.
- B. Fasteners:
 - 1. Aluminum Panels: Use aluminum or stainless steel fasteners for surfaces exposed to the exterior; use aluminum or galvanized-steel fasteners for surfaces exposed to the interior.
- C. Anchor Clips: Anchor metal roof panels and other components of the Work securely in place, using manufacturer's approved fasteners according to manufacturers' written instructions.
- D. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.
- E. Standing-Seam Metal Roof Panel Installation: Fasten metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended in writing by manufacturer.
 - 1. Install clips to supports with self-tapping fasteners.
 - 2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
 - 3. Snap Joint: Nest standing seams and fasten together by interlocking and completely engaging factory-applied sealant.
 - 4. Seamed Joint: Crimp standing seams with manufacturer-approved, motorized seamer tool so clip, metal roof panel, and factory-applied sealant are completely engaged.
 - 5. Watertight Installation:

- a. Apply a continuous ribbon of sealant or tape to seal joints of metal panels, using sealant or tape as recommend in writing by manufacturer as needed to make panels watertight.
- b. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
- c. At panel splices, nest panels with minimum 6-inch end lap, sealed with sealant and fastened together by interlocking clamping plates.
- F. Clipless Metal Panel Installation: Fasten metal panels to supports with screw fasteners at each lapped joint at location and spacing recommended by manufacturer.
- G. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
 - 1. Install components required for a complete metal panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal roof panel manufacturers; or, if not indicated, types recommended by metal roof panel manufacturer.
- H. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
 - 1. Install exposed flashing and trim that is without buckling and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and achieve waterproof and weather-resistant performance.
 - 2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).
- I. Gutters: Join sections with riveted and soldered or lapped and sealed joints. Attach gutters to eave with gutter hangers spaced not more than 36 inches o.c. using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.
- J. Downspouts: Join sections with telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch away from walls; locate fasteners at top and bottom and at approximately 60 inches o.c. in between.
 - 1. Provide elbows at base of downspouts to direct water away from building.
 - 2. Connect downspouts to underground drainage system indicated.
- K. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to metal roof panels as recommended by manufacturer.

3.5 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align metal panel units within installed tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.6 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect metal roof panel installation, including accessories. Report results in writing.
- B. Remove and replace applications of metal roof panels where tests and inspections indicate that they do not comply with specified requirements.
- C. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.
- D. Prepare test and inspection reports.

3.7 CLEANING AND PROTECTION

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

END OF SECTION 074113.16

SECTION 074646 - FIBER CEMENT SIDING PANELS

PART1 - GENERAL

1.1 SECTION INCLUDES

A. Fiber cement lap siding, panels, shingle, trim, fascia, moulding and accessories; James Hardie HZ5 Engineered for Climate Siding.

1.2 RELATED SECTIONS

- A. Section 06100 Rough Carpentry: Wood framing and bracing.
- B. Section 06100 Rough Carpentry: Sheathing.
- C. Section 07210 Insulation: Exterior wall insulation.

1.3 REFERENCES

- A. ASTM C1186 Standard Specification for Flat Fiber-Cement Sheets
- B. ASTM D3359 Standard Test Method for Measuring Adhesion by Tape Test, Tool and Tape.
- C. ASTM E136 Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 degrees C.

1.4 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- C. Shop Drawings: Provide detailed drawings of atypical non-standard applications of cementitious siding materials which are outside the scope of the standard details and specifications provided by the manufacturer.
- D. Verification Samples: For each finish product specified, two samples, minimum size 4 by 6 inches, representing actual product, color, and patterns.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Minimum of 2 years experience with installation of similar products.
- B. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
 - 1. Finish areas designated by Architect.
 - 2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
 - 3. Refinish mock-up area as required to produce acceptable work.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store siding on edge or lay flat on a smooth level surface. Protect edges and corners from chipping. Store sheets under cover and keep dry prior to installing.
- C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.7 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.

1.8 WARRANTY

- A. Product Warranty: Limited, non-pro-rated product warranty.
 - 1. HardiePlank HZ5 lap siding for 30 years.
 - 2. HardieSoffit HZ5 panels for 30 years.
- B. Product Warranty: Limited, product warranty.
 - 1. HardieTrim HZ and HZ5 boards for 15 years.
- C. Finish Warranty: Limited product warranty against manufacturing finish defects.
 - 1. When used for its intended purpose, properly installed and maintained according to James Hardie's published installation instructions, James Hardie's ColorPlus finish with ColorPlus Technology, for a period of 15 years from the date of purchase: will not peel; will not crack; and will not chip. Finish warranty includes the coverage for labor and material.

D. Workmanship Warranty: Application limited warranty for 2 years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: James Hardie Building Products, Inc., which is located at: 26300 La Alameda Suite 400 ; Mission Viejo, CA 92691; Toll Free Tel: 866-274-3464; Tel: 949-367-4980; Fax: 949-367-4981; Email: request info (info@jameshardie.com); Web: www.jameshardiepros.com.
- B. Requests for approval of equal substitutions will be considered in accordance with provisions of Section 01600.

2.2 SIDING

- A. Lap Siding: HardiePlank HZ5 Lap siding with a sloped top, beveled drip edge and nailing line as manufactured by James Hardie Building Products, Inc.
 - 1. Type: Smooth 5-1/4 inches with 4 inches exposure.
- B. HardiePanel HZ5 vertical siding as manufactured by James Hardie Building Products, Inc.
 - 1. Type: Smooth 120"x48" panel, 0.312" thick
- C. HardieTrim HZ5 boards as manufactured by James Hardie Building Products, Inc.
 - 1. Type: Smooth Batten Boards 144"x2.5" boards, 0.75" thick

2.3 FINISHES

- A. Factory Primer: Provide factory applied universal primer.
 - 1. Primer: Factory primed by James Hardie.
 - 2. Topcoat: Refer to Section 09900 and Exterior Finish Schedule.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If framing preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

- C. Nominal 2 inch by 4 inch wood framing selected for minimal shrinkage and complying with local building codes, including the use of water-resistive barriers or vapor barriers where required. Minimum 1-1/2 inches face and straight, true, of uniform dimensions and properly aligned.
 - 1. Install water-resistive barriers and claddings to dry surfaces.
 - 2. Repair any punctures or tears in the water-resistive barrier prior to the installation of the siding.
 - 3. Protect siding from other trades.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Install a water-resistive barrier is required in accordance with local building code requirements.
- D. The water-resistive barrier must be appropriately installed with penetration and junction flashing in accordance with local building code requirements.
- E. Install Engineered for Climate HardieWrap weather barrier in accordance with local building code requirements.
- F. Use HardieWrap Seam Tape and joint and laps.
- G. Install HardieWrap flashing, and HardieWrap Flex Flashing
- 3.3 INSTALLATION HARDIEPLANK HZ5 LAP SIDING
 - A. Install materials in strict accordance with manufacturer's installation instructions.
 - B. Starting: Install a minimum 1/4 inch thick lath starter strip at the bottom course of the wall. Apply planks horizontally with minimum 1-1/4 inches wide laps at the top. The bottom edge of the first plank overlaps the starter strip.
 - C. Allow minimum vertical clearance between the edge of siding and any other material in strict accordance with the manufacturer's installation instructions.
 - D. Align vertical joints of the planks over framing members.
 - E. Maintain clearance between siding and adjacent finished grade.
 - F. Locate splices at least one stud cavity away from window and door openings.
 - G. Wind Resistance: Where a specified level of wind resistance is required Hardieplank lap siding is installed to framing members and secured with fasteners described in Table No. 2 in National Evaluation Service Report No. NER-405.

H. Locate splices at least 12 inches away from window and door openings.

3.4 INSTALLATION - HARDIEPANEL HZ5 VERTICAL SIDING

- A. Install materials in strict accordance with manufacturer's installation instructions.
- B. Block framing between studs where HardiePanel siding horizontal joints occur.
- C. Install metal Z flashing and provide a 1/4 inch gap at horizontal panel joints.
- D. Place fasteners no closer than 3/8 inch from panel edges and 2 inches from panel corners.
- E. Allow minimum vertical clearance between the edge of siding and any other material in strict accordance with the manufacturer's installation instructions.
- F. Maintain clearance between siding and adjacent finished grade.
- G. Specific framing and fastener requirements refer to Tables 2 and 3 in National Evaluation Service Report No. NER-405.
- H. Factory Finish Touch Up: Apply touch up paint to cut edges in accordance with manufacturer's printed instructions.
 - 1. Touch-up nicks, scrapes, and nail heads in pre-finished siding using the manufacturer's touch-up kit pen.
 - 2. Touch-up of nails shall be performed after application, but before plastic protection wrap is removed to prevent spotting of touch-up finish.
 - 3. Use touch-up paint sparingly. If large areas require touch-up, replace the damaged area with new pre-finished siding. Match touch up color to siding color through use of manufacturer's branded touch-up kits.

3.5 INSTALLATION - HARDIETRIM HZ5 BOARDS

- A. Install materials in strict accordance with manufacturer's installation instructions. Install flashing around all wall openings.
- B. Fasten through trim into structural framing or code complying sheathing. Fasteners must penetrate minimum 3/4 inch or full thickness of sheathing. Additional fasteners may be required to ensure adequate security.
- C. Place fasteners no closer than 3/4 inch and no further than 2 inches from side edge of trim board and no closer than 1 inch from end. Fasten maximum 16 inches on center.
- D. Maintain clearance between trim and adjacent finished grade.
- E. Trim inside corner with a single board trim both side of corner.

MasterSpec

- F. Outside Corner Board Attach Trim on both sides of corner with 16 gage corrosion resistant finish nail 1/2 inch from edge spaced 16 inches apart, weather cut each end spaced minimum 12 inches apart.
- G. Allow 1/8 inch gap between trim and siding.
- H. Seal gap with high quality, paint-able caulk.
- I. Shim frieze board as required to align with corner trim..
- J. Fasten through overlapping boards. Do not nail between lap joints.
- K. Overlay siding with single board of outside corner board then align second corner board to outside edge of first corner board. Do not fasten HardieTrim boards to HardieTrim boards.
- L. Shim frieze board as required to align with corner trim.
- M. Install HardieTrim Fascia boards to rafter tails or to sub fascia.
- 3.6 FINISHING
 - A. Finish unprimed siding with a minimum one coat high quality, alkali resistant primer and one coat of either, 100 percent acrylic or latex or oil based, exterior grade topcoats or two coats high quality alkali resistant 100 percent acrylic or latex, exterior grade topcoat within 90 days of installation. Follow paint manufacturer's written product recommendation and written application instructions.
- 3.7 PROTECTION
 - A. Protect installed products until completion of project.
 - B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

MasterSpec

SECTION 075423 - THERMOPLASTIC POLYOLEFIN (TPO) ROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Adhered thermoplastic polyolefin (TPO) roofing system.
 - 2. Vapor retarder.
- B. Related Requirements:
 - 1. Section 061000 "Rough Carpentry" for wood nailers, curbs, and blocking; and for wood-based, structural-use roof deck panels.
 - 2. Section 061600 "Sheathing" for wood-based, structural-use roof deck panels.
 - 3. Section 072100 "Thermal Insulation" for insulation beneath the roof deck.
 - 4. Section 076200 "Sheet Metal Flashing and Trim" for metal roof flashings and counterflashings.
 - 5. Section 079200 "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 and Waterproofing Manual" apply to work of this Section.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work, including:
 - 1. Base flashings and membrane terminations.
 - 2. Tapered insulation, including slopes.
 - 3. Roof plan showing orientation of steel roof deck and orientation of roofing, fastening spacings, and patterns for mechanically fastened roofing.
 - 4. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
- C. Samples for Verification: For the following products:

THERMOPLASTIC POLYOLEFIN (TPO) ROOFING

- 1. Sheet roofing, of color required.
- 2. Walkway pads or rolls, of color required.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and manufacturer.
- B. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.
 - 1. Submit evidence of compliance with performance requirements.
- C. Product Test Reports: For components of roofing system, tests performed by manufacturer and witnessed by a qualified testing agency.
- D. Research/Evaluation Reports: For components of roofing system, from ICC-ES.
- E. Sample Warranties: For manufacturer's special warranties.
- 1.6 CLOSEOUT SUBMITTALS
 - A. Maintenance Data: For roofing system to include in maintenance manuals.
- 1.7 QUALITY ASSURANCE
 - A. Manufacturer Qualifications: A qualified manufacturer that is UL listed or for roofing system identical to that used for this Project.
- 1.8 DELIVERY, STORAGE, AND HANDLING
 - A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.
 - B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
 - 1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.
 - C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

D. Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck.

1.9 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.

1.10 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 roofing, base flashings, fasteners, cover boards, substrate board, roofing accessories, and other components of roofing system.
 - 2. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Carlisle SynTec Incorporated.
 - 2. Firestone Building Products.
 - 3. GAF Materials Corporation.
 - 4. Johns Manville.
 - 5. Versico Incorporated.
- B. Source Limitations: Obtain components including fasteners for roofing system from same manufacturer as membrane roofing.

2.2 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. Roofing and base flashings shall remain watertight.
 - 1. Accelerated Weathering: Roofing system shall withstand 2000 hours of exposure when tested according to ASTM G 152, ASTM G 154, or ASTM G 155.
 - 2. Impact Resistance: Roofing system shall resist impact damage when tested according to ASTM D 3746 or ASTM D 4272.

MasterSpec

- B. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roofing manufacturer based on testing and field experience.
- C. Solar Reflectance Index: Not less than 78 when calculated according to ASTM E 1980, based on testing identical products by a qualified testing agency.
- D. Fire-Resistance Ratings: Comply with fire-resistance-rated assembly designs indicated. Identify products with appropriate markings of applicable testing agency.

2.3 TPO ROOFING

- A. Fabric-Reinforced TPO Sheet: ASTM D 6878, internally fabric- or scrim-reinforced, uniform, flexible fabric-backed TPO sheet.
 - 1. Thickness: 60 mils, nominal.
 - 2. Exposed Face Color: White.

2.4 AUXILIARY ROOFING MATERIALS

- A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with roofing.
 - 1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.
- B. Sheet Flashing: Manufacturer's standard unreinforced TPO sheet flashing, 55 mils thick, minimum, of same color as TPO sheet.
- C. Bonding Adhesive: Manufacturer's standard, water based.
- D. Slip Sheet: Manufacturer's standard, of thickness required for application.
- E. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch thick; with anchors.
- F. Metal Battens: Manufacturer's standard, aluminum-zinc-alloy-coated or zinc-coated steel sheet, approximately 1 inch wide by 0.05 inch thick, prepunched.
- G. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Global 4470, designed for fastening roofing to substrate, and acceptable to roofing system manufacturer.
- H. 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.

2.5 VAPOR RETARDER

- A. Polyethylene Film: ASTM D 4397, 6 mils thick, minimum, with maximum permeance rating of 0.13 perm.
 - 1. Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.

2.6 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.

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 053100 "Steel Decking."
 - 4. Verify that minimum concrete drying period recommended by roofing system manufacturer has passed.
 - 5. Verify that concrete substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
 - 6. Verify that concrete-curing compounds that will impair adhesion of roofing components to roof deck have been removed.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing 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. Install 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 the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.
 - C. Install roofing and auxiliary materials to tie in to existing roofing to maintain weathertightness of transition and to not void warranty for existing roofing system.

3.4 ADHERED ROOFING INSTALLATION

- A. Adhere roofing over area to receive roofing according to roofing system manufacturer's written instructions. Unroll roofing and allow to relax before retaining.
- B. Accurately align roofing, and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
- C. Bonding Adhesive: Apply to substrate and underside of roofing at rate required by manufacturer, and allow to partially dry before installing roofing. Do not apply to splice area of roofing.
- D. In addition to adhering, mechanically fasten roofing securely at terminations, penetrations, and perimeter of roofing.
- E. Apply roofing with side laps shingled with slope of roof deck where possible.
- F. Seams: Clean seam areas, overlap roofing, and hot-air weld side and end laps of roofing and sheet flashings according to manufacturer's written instructions, to ensure a watertight seam installation.
 - 1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of sheet.
 - 2. Verify field strength of seams a minimum of twice daily, and repair seam sample areas.
 - 3. Repair tears, voids, and lapped seams in roofing that do not comply with requirements.
- G. Spread sealant bed over deck-drain flange at roof drains, and securely seal roofing in place with clamping ring.

3.5 BASE FLASHING INSTALLATION

- A. Install sheet flashings and preformed flashing accessories, and adhere to substrates according to 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. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.6 WALKWAY INSTALLATION

A. Flexible Walkways: Install walkway products as required to maintain warranty, by code and where indicated on the drawings. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

3.7 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 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.

END OF SECTION 075423

MasterSpec

SECTION 076200 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

- 1. Manufactured through-wall flashing with counterflashing.
- 2. Manufactured reglets with counterflashing.
- 3. Formed roof-drainage sheet metal fabrications.
- 4. Formed low-slope roof sheet metal fabrications.
- 5. Formed wall sheet metal fabrications.
- 6. Formed equipment support flashing.
- B. Related Requirements:
 - 1. Section 061000 "Rough Carpentry" for wood nailers, curbs, and blocking.
 - 2. Section 075423 "TPO Roofing" for installation of sheet metal flashing and trim integral with roofing.
 - 3. Section 074213 "Metal Wall Panels" for sheet metal flashing and trim integral with metal wall panels.
 - 4. Section 077200 "Roof Accessories" for set-on-type curbs, equipment supports, roof hatches, vents, and other manufactured roof accessory units.

1.3 COORDINATION

- A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.
- B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.4 ACTION SUBMITTALS

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

SHEET METAL FLASHING AND TRIM

- B. Shop Drawings: For sheet metal flashing and trim.
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work.
 - 3. Include identification of material, thickness, weight, and finish for each item and location in Project.
 - 4. Include details for forming, including profiles, shapes, seams, and dimensions.
 - 5. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
 - 6. Include details of termination points and assemblies.
 - 7. Include details of roof-penetration flashing.
 - 8. Include details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counterflashings as applicable.
 - 9. Include details of special conditions.
 - 10. Include details of connections to adjoining work.
 - 11. Detail formed flashing and trim at scale of not less than 3 inches per 12 inches.
- C. Samples for Verification: For each type of exposed finish.
 - 1. Sheet Metal Flashing: 12 inches long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.
 - 2. Trim, Metal Closures, Expansion Joints, Joint Intersections, and Miscellaneous Fabrications: 12 inches long and in required profile. Include fasteners and other exposed accessories.
 - 3. Unit-Type Accessories and Miscellaneous Materials: Full-size Sample.
 - 4. Anodized Aluminum Samples: Samples to show full range to be expected for each color required.

1.5 INFORMATIONAL SUBMITTALS

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

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For sheet metal flashing and trim, and its accessories, to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

- 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 mockup of typical roof edge, including fascia, approximately four (4) feet long, including supporting construction cleats, seams, attachments and accessories.
 - 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.

1.8 DELIVERY, STORAGE, AND HANDLING

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

1.9 WARRANTY

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

SHEET METAL FLASHING AND TRIM

MasterSpec

- 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 roof edge flashings tested according to SPRI ES-1 and capable of resisting the following design pressure:
 - 1. Design Pressure: 230 psf.
- 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. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.
- B. Aluminum Sheet: ASTM B 209, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required; with smooth, flat surface.
 - 1. Exposed Coil-Coated Finish:
 - a. Three-Coat Fluoropolymer: AAMAAAMA 2605. Fluoropolymer finish containing not less than 70 percent 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.
 - 2. Color: tTo match adjacent assembly as selected by Architect from manufacturer's full range, as shown on drawings.
 - 3. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil.

2.3 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.
- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.

- 1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
 - a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
 - b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
 - c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.
- 2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
- C. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.
- D. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.

2.4 MANUFACTURED SHEET METAL FLASHING AND TRIM

- A. Through-Wall, Ribbed, Sheet Metal Flashing: Manufacture through-wall sheet metal flashing for embedment in masonry, with ribs at 3-inch intervals along length of flashing to provide integral mortar bond. Manufacture through-wall flashing with snaplock receiver on exterior face to receive counterflashing.
 - 1. Stainless Steel: 0.016 inch thick.
 - a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Cheney Flashing Company; Cheney Flashing (Sawtooth).
 - 2) Hohmann & Barnard, Inc; STF Sawtooth Flashing.
 - 3) Keystone Flashing Company, Inc; Keystone Three-Way Interlocking Thruwall Flashing.
 - 4) Sandell Manufacturing Co., Inc; Pre-Formed Metal Flashing.
- B. Reglets: Units of type, material, and profile required, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated with factory-mitered and -welded corners and junctions and with interlocking counterflashing on exterior face, of same metal as reglet.
 - 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. Fry Reglet Corporation.
 - b. Heckmann Building Products, Inc.

- c. Hickman Company, W. P.
- 2. Material: Aluminum, 0.024 inch thick.
- 3. 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.
- 4. Finish: With manufacturer's standard color coating.

2.5 FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
 - 1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
 - 2. Obtain field measurements for accurate fit before shop fabrication.
 - 3. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
 - 4. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.
- B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
- C. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."
- D. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.
 - 1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
 - 2. Use lapped expansion joints only where indicated on Drawings.
- E. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.
- F. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
- G. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard for application, but not less than thickness of metal being secured.

MasterSpec

- H. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use.
- I. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints where necessary for strength.
- J. Do not use graphite pencils to mark metal surfaces.

2.6 ROOF-DRAINAGE SHEET METAL FABRICATIONS

- A. Downspouts: Fabricate rectangular downspouts to dimensions indicated, complete with mitered elbows. Furnish with metal hangers from same material as downspouts and anchors .
 - 1. Fabricate from the following materials:
 - a. Aluminum: 0.024 inch thick.
- B. Parapet Scuppers: Fabricate scuppers to dimensions required, with closure flange trim to exterior, 4-inch- wide wall flanges to interior, and base extending 4 inches beyond cant or tapered strip into field of roof. Fabricate from the following materials:
 - 1. Aluminum: 0.032 inch thick.
- C. Conductor Heads: Fabricate conductor heads with flanged back and stiffened top edge and of dimensions and shape required, complete with outlet tubes, exterior flange trim, and built-in overflows. Fabricate from the following materials:
 - 1. Aluminum: 0.032 inch thick.
- D. Splash Pans: Fabricate to dimensions and shape required and from the following materials:
 - 1. Aluminum: 0.040 inch thick.

2.7 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

- A. Roof Edge Flashing (Gravel Stop) and Fascia Cap: Fabricate in minimum 96-inchlong, but not exceeding 12-foot- long sections. Furnish with 6-inch- wide, joint cover plates.
 - 1. Joint Style: Overlapped, 4 inches wide.
 - 2. Fabricate from the Following Materials:
 - a. Aluminum: 0.050 inch thick.

- B. Copings: Fabricate in minimum 96-inch- long, but not exceeding 12-foot- long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and drill elongated holes for fasteners on interior leg. Miter corners, fasten and seal watertight.
 - 1. Joint Style: Butted with expansion space and 6-inch- wide, concealed backup plate.
 - 2. Fabricate from the Following Materials:
 - a. Aluminum: 0.050 inch thick.
- C. Base Flashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:
 - 1. Aluminum: 0.040 inch thick.
- D. Counterflashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:
 - 1. Aluminum: 0.032 inch thick.
- E. Flashing Receivers: Fabricate from the following materials:
 - 1. Aluminum: 0.032 inch thick.
- F. Roof-Penetration Flashing: Fabricate from the following materials:
 - 1. Stainless Steel: 0.019 inch thick.
- G. Roof-Drain Flashing: Fabricate from the following materials:
 - 1. Stainless Steel: 0.016 inch thick.
- 2.8 WALL SHEET METAL FABRICATIONS
 - A. Through-Wall Flashing: Fabricate continuous flashings in minimum 96-inch- long, but not exceeding 12-foot- long, sections, under copings, and at shelf angles. Fabricate discontinuous lintel, sill, and similar flashings to extend 6 inches beyond each side of wall openings; and form with 2-inch- high, end dams. Fabricate from the following materials:
 - 1. Stainless Steel: 0.016 inch thick.
 - B. Opening Flashings in Frame Construction: Fabricate head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings. Form head and sill flashing with 2-inch- high, end dams. Fabricate from the following materials:
 - 1. Aluminum: 0.032 inch thick.

2.9 MISCELLANEOUS SHEET METAL FABRICATIONS

- A. Equipment Support Flashing: Fabricate from the following materials:
 - 1. Stainless Steel: 0.019 inch thick.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.
 - 1. Verify compliance with requirements for installation tolerances of substrates.
 - 2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
 - 3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 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, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
 - 1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
 - 2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
 - 3. Space cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
 - 4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
 - 5. Torch cutting of sheet metal flashing and trim is not permitted.
 - 6. Do not use graphite pencils to mark metal surfaces.
- B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.

- 1. Coat concealed side of uncoated-aluminum and stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
- 2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.
- D. Fasteners: Use fastener sizes that penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.
- E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.
- F. Seal joints as required for watertight construction.
 - Use sealant-filled joints unless otherwise indicated. Embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
 - 2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."
- G. Rivets: Rivet 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 cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.
- B. Downspouts: Join sections with 1-1/2-inch telescoping joints.
 - 1. Provide hangers with fasteners designed to hold downspouts securely to walls. Locate hangers at top and bottom and at approximately 60 inches o.c.
 - 2. Provide elbows at base of downspout to direct water away from building.
 - 3. Connect downspouts to underground drainage system.
- C. Splash Pans: Install where downspouts discharge on low-slope roofs. Set in elastomeric sealant compatible with the substrate.
- D. Parapet Scuppers: 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 with elastomeric sealant to scupper.
- 2. Loosely lock front edge of scupper with conductor head.
- 3. seal with elastomeric sealant exterior wall scupper flanges into back of conductor head.
- E. Conductor Heads: Anchor securely to wall, with elevation of conductor head rim at minimum of 1 inch below scupper discharge.
- F. Expansion-Joint Covers: Install expansion-joint covers at locations and of configuration indicated. Lap joints minimum of 4 inches in direction of water flow.

3.4 ROOF FLASHING INSTALLATION

- A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and cited sheet metal standard. Provide concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.
- B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in cited sheet metal standard unless otherwise indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at staggered 3-inch centers.
- C. Copings: Anchor to resist uplift and outward forces according to recommendations in cited sheet metal standard unless otherwise indicated.
 - 1. Interlock exterior bottom edge of coping with continuous cleat anchored to substrate at 16-inch centers.
 - 2. Anchor interior leg of coping with washers and screw fasteners through slotted holes at Insert dimension centers.
- D. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 4 inches 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 over base flashing. Lap counterflashing joints minimum of 4 inches. Secure in waterproof manner by means of interlocking folded seam or blind rivets and sealant unless otherwise indicated.
- F. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with butyl sealant and clamp flashing to pipes that penetrate roof.

3.5 WALL FLASHING INSTALLATION

- General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.
- B. Through-Wall Flashing: Installation of through-wall flashing is specified in Section 042000 "Unit Masonry."
- C. Opening Flashings in Frame Construction: Install continuous head, sill, and similar flashings to extend 4 inches beyond wall openings.

3.6 MISCELLANEOUS FLASHING INSTALLATION

- A. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to equipment support member.
- B. Overhead-Piping Safety Pans: Suspend pans from structure above, independent of other overhead items such as equipment, piping, and conduit, unless otherwise indicated on Drawings. Pipe and install drain line to plumbing waste or drainage system.

3.7 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
- B. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

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.
- C. Clean off excess sealants.
- D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended by sheet metal flashing and trim manufacturer. Maintain sheet metal flashing and trim in clean condition during construction.

SHEET METAL FLASHING AND TRIM

E. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 076200

SECTION 077100 - 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. Reglets and counterflashings.
- B. Related Requirements:
 - 1. Section 055000 "Metal Fabrications" for downspout guards and downspout boots.
 - 2. Section 061000 "Rough Carpentry" Section 061053 "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking.
 - 3. Section 074113.13 "Formed Metal Roof Panels" for roof-edge drainage-system components provided by metal-roof-panel manufacturer.
 - 4. Section 074113.16 "Standing-Seam Metal Roof Panels" for roof-edge drainage-system components provided by metal-roof-panel manufacturer.
 - 5. Section 074113.19 "Batten-Seam Metal Roof Panels" for roof-edge drainage-system components provided by metal-roof-panel manufacturer.
 - 6. Section 074116 "Insulated Metal Roof Panels" for roof-edge drainage-system components provided by metal-roof-panel manufacturer.
 - 7. Section 076200 "Sheet Metal Flashing and Trim" for custom- and site-fabricated sheet metal flashing and trim.
 - 8. Section 077129 "Manufactured Roof Expansion Joints" for manufactured roof expansion-joint cover assemblies.
 - 9. Section 077200 "Roof Accessories" for set-on-type curbs, equipment supports, roof hatches, vents, and other manufactured roof accessory units.
 - 10. Section 077253 "Snow Guards" for manufactured snow guard devices.
 - 11. Section 079200 "Joint Sealants" for field-applied sealants between roof specialties and adjacent materials.
- C. Preinstallation Conference: Conduct conference at [Project site] <Insert location>.

- 1. Meet with Owner, Architect, Owner's insurer if applicable, roofing-system testing and inspecting agency representative, roofing Installer, roofing-system manufacturer's representative, Installer, structural-support Installer, and installers whose work interfaces with or affects roof specialties, including installers of roofing materials and accessories.
- 2. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
- 3. Review special roof details, roof drainage, and condition of other construction that will affect roof specialties.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. 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 each type of roof specialty and for each color and texture specified.
- D. Samples for Initial Selection: For each type of roof specialty indicated with factory-applied color finishes.
- E. 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] [reglets and counterflashings] made from 12-inch lengths of full-size components in specified material, and including fasteners, cover joints, accessories, and attachments.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer.
- B. Product Certificates: For each type of roof specialty.

- C. Product Test Reports: For [copings] [and] [roof-edge flashings], for tests performed by a qualified testing agency.
- D. Sample Warranty: For manufacturer's special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roofing specialties to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer offering products meeting requirements that are [FM Approvals listed for specified class] [and] [SPRI ES-1 tested to specified design pressure].
- B. Source Limitations: Obtain roof specialties approved by manufacturer providing roofing-system warranty specified in Section <Insert Section number and title>.
- 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. Build mockup of typical roof edge as part of Integrated Exterior Mockup specified in Section 014000 "Quality Requirements"
 - 3. Build mockup of typical roof edge, including [fascia] [gutter] [and] [downspout] <Insert item>, approximately [10 feet] <Insert dimension> long, including supporting construction, seams, attachments,[underlayment,] and accessories.
 - 4. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 5. 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. 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.

1.8 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.

1.9 WARRANTY

- A. Roofing-System Warranty: Roof specialties are included in warranty provisions in Section <Insert Section number> "<Insert roof Section title>."
- 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: [20] [10] <Insert number> 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. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than <Insert value> percent.
- FM Approvals' Listing: Manufacture and install [copings] [roof-edge specialties] that are listed in FM Approvals' "RoofNav" and approved for windstorm classification, [Class 1-60] [Class 1-75] [Class 1-90] [Class 1-105] [Class 1-120] <Insert class>. Identify materials with FM Approvals' markings.

- D. SPRI Wind Design Standard: Manufacture and install [copings] [roof-edge specialties] tested according to SPRI ES-1 and capable of resisting the following design pressures:
 - 1. Design Pressure: [As indicated on Drawings] <Insert design pressure>.
- E. 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, ambient; 180 deg F] <Insert temperature range>, material surfaces.

2.2 ROOF-EDGE SPECIALTIES

- A. Canted Roof-Edge : Manufactured, two-piece, roof-edge fascia consisting of metal fascia cover in section lengths not exceeding and a continuous formed galvanized-steel sheet cant, 0.028 inch thick, minimum, with extended vertical leg terminating in a drip-edge cleat. Provide matching corner units.
- B. Roof-Edge Fascia: Manufactured, two-piece, roof-edge fascia consisting of snap-on metal fascia cover in section lengths not exceeding and a continuous metal receiver with integral drip-edge cleat to engage fascia cover . Provide matching corner units.
 - 1. Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

2.3 ROOF-EDGE DRAINAGE SYSTEMS

- A. Gutters: Manufactured in uniform section lengths not exceeding, with matching corner units, ends, outlet tubes, and other accessories. Elevate back edge at least 1 inch above front edge. Furnish flat-stock gutter straps, gutter brackets, expansion joints, and expansion-joint covers fabricated from same metal as gutters.
- B. Downspouts: complete with elbows, manufactured from the following exposed metal. Furnish with metal hangers, from same material as downspouts, and anchors.
- C. Parapet Scuppers: Manufactured with closure flange trim to exterior, 4-inch- wide wall flanges to interior, and base extending 4 inches 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, complete with outlet tube that nests into upper end of downspout.
- E. Zinc-Coated Steel Finish: .
- F. Aluminum Finish: .
- G. Stainless Steel Finish: .
- H. Copper Finish: .

2.4 MISCELLANEOUS MATERIALS

- A. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to meet performance requirements. Furnish the following unless otherwise indicated:
 - 1. Exposed Penetrating Fasteners: Gasketed screws with hex washer heads matching color of sheet metal.
 - 2. Fasteners for Copper Sheet: Copper, hardware bronze, or passivated Series 300 stainless steel.
 - 3. Fasteners for Aluminum: Aluminum or Series 300 stainless steel.
 - 4. Fasteners for Stainless Steel Sheet: Series 300 stainless steel.
 - 5. Fasteners for Zinc-Coated (Galvanized) Steel Sheet: Series 300 stainless steel or hot-dip zinc-coated steel according to ASTM A153/A153M or ASTM F2329.
- B. Elastomeric Sealant: ASTM C920, elastomeric polyurethane silicone polymer sealant of type, grade, class, and use classifications required by roofing-specialty manufacturer for each application.
- C. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type joints with limited movement.
- D. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.
- E. Asphalt Roofing Cement: ASTM D4586, asbestos free, of consistency required for application.
- F. Solder for Copper: ASTM B32, lead-free solder Grade Sn50, 50 percent tin and 50 percent lead Insert solder grade.

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 and painted 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 unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. Coil-Coated Galvanized-Steel Sheet Finishes:
 - 1. High-Performance Organic Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with ASTM A755/A755M and coating and resin manufacturers' written instructions.
 - a. Concealed Surface Finish: Apply pretreatment and manufacturer's standard acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.
- E. 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. Concealed Surface Finish: Apply pretreatment and manufacturer's standard acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.
- F. 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. Concealed Surface Finish: Apply pretreatment and manufacturer's standard acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

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, 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] <Insert dimension> with no joints within [18 inches] <Insert dimension> of corners or intersections unless otherwise indicated on Drawings.
 - 2. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures.
- Fastener Sizes: Use fasteners of sizes that penetrate [wood blocking or sheathing not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws]
 [substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance] <Insert size requirement>.
- 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.

 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; 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.

3.3 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.
 - 1. Interlock face and back leg drip edges of snap-on coping cap into cleated anchor plates anchored to substrate at [30-inch centers] [40-inch centers] [manufacturer's required spacing that meets performance requirements]
 - 2. Interlock face-leg drip edge into continuous cleat anchored to substrate at [24-inch centers] [16-inch centers] [manufacturer's required spacing that meets performance requirements] <Insert spacing>. Anchor back leg of coping with screw fasteners and elastomeric washers at [24-inch centers] [16-inch centers] [manufacturer's required spacing that meets performance requirements] <Insert spacing >.

3.4 INSTALLATION OF ROOF-EDGE SPECIALITIES

- A. Install cleats, cants, and other anchoring and attachment accessories and devices with concealed fasteners.
- B. Anchor roof edgings with manufacturer's required devices, fasteners, and fastener spacing to meet performance requirements.

3.5 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 [12 inches] [24 inches] [30 inches] <Insert dimension> 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] <Insert dimension> apart. Install expansion-joint caps.

- 2. Install continuous leaf guards on gutters with noncorrosive fasteners, [removable] [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 away from walls; locate fasteners at top and bottom and at approximately [60 inches] Insert dimension> 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] <Insert surface>. Set in asphalt roofing cement 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 below [scupper] [gutter] discharge.
- 3.6 INSTALLATION OF REGLETS AND COUNTERFLASHINGS
 - A. Coordinate installation of reglets and counterflashings with installation of base flashings.
 - B. Embedded Reglets: See [Section 033000 "Cast-in-Place Concrete"] [and] [Section 042000 "Unit Masonry"] for installation of reglets.
- 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 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 077100

SECTION 077200 - ROOF ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Roof hatches.
 - 2. Roof access ladders.
- B. Related Sections:
 - 1. Section 055213 "Pipe and Tube Railings" for safety railing systems not attached to roof-hatch curbs.
 - 2. Section 076200 "Sheet Metal Flashing and Trim" for shop- and field-formed metal flashing, roof-drainage systems, roof expansion-joint covers, and miscellaneous sheet metal trim and accessories.
 - 3. Section 086200 "Unit Skylights" for single- and double-glazed domed plastic skylights with curb frame.

1.3 COORDINATION

- A. Coordinate layout and installation of roof accessories with roofing membrane and base flashing and interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.
- B. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of roof accessory.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For roof accessories.

- 1. Include plans, elevations, keyed details, and attachments to other work. Indicate dimensions, loadings, and special conditions. Distinguish between plant- and field-assembled work.
- C. Samples: For each exposed product and for each color and texture specified, prepared on Samples of size to adequately show color.
- D. Delegated-Design Submittal: For roof curbs, equipment supports, and walkways indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 - 1. Detail mounting, securing, and flashing of roof-mounted items to roof structure. Indicate coordinating requirements with roof membrane system.
 - 2. Wind-Restraint Details: Detail fabrication and attachment of wind restraints. Show anchorage details and indicate quantity, diameter, and depth of penetration of anchors.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Roof plans, drawn to scale, and coordinating penetrations and roof-mounted items. Show the following:
 - 1. Size and location of roof accessories specified in this Section.
 - 2. Method of attaching roof accessories to roof or building structure.
 - 3. Other roof-mounted items including mechanical and electrical equipment, ductwork, piping, and conduit.
 - 4. Required clearances.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For roof accessories to include in operation and maintenance manuals.

1.7 WARRANTY

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Roof accessories shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

2.2 ROOF HATCH

- A. Roof Hatches: Metal roof-hatch units with lids and insulated single double-walled curbs, welded or mechanically fastened and sealed corner joints, continuous lid-to-curb counterflashing and weathertight perimeter gasketing,straight sides, and integrally formed deck-mounting flange at perimeter bottom.
 - 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. Acudor Products, Inc.
 - b. AES Industries, Inc.
 - c. Babcock-Davis.
 - d. Bilco Company (The).
 - e. Bristolite Skylights.
 - f. Custom Solution Roof and Metal Products.
 - g. Dur-Red Products.
 - h. JL Industries, Inc.; a division of the Activar Construction Products Group.
 - i. KCC International Inc.
 - j. Lexcor; a division of Luxsuco corp.
 - k. Metallic Products Corp.
 - I. Milcor; Commercial Products Group of Hart & Cooley, Inc.
 - m. Nystrom, Inc.
 - n. O'Keeffe's Inc.
 - o. Williams Brothers Corporation of America.
- B. Loads: Minimum 40-lbf/sq. ft. external live load and 20-lbf/sq. ft. internal uplift load.
- C. Construction:
 - 1. Insulation: Cellulosic-fiber board Glass-fiber board.
 - a. R-Value: 12.0 according to ASTM C 1363.
 - 2. Nailer: Factory-installed wood nailer continuous around hatch perimeter.
 - 3. Hatch Lid: Opaque, insulated, and double walled, with manufacturer's standard metal liner of same material and finish as outer metal lid.

MasterSpec

- 4. Curb Liner: Manufacturer's standard, of same material and finish as metal curb.
- 5. Fabricate curbs to minimum height of 12 inches above roofing surface unless otherwise indicated.
- D. Hardware: Spring operators, hold-open arm, galvanized stainless-steel spring latch with turn handles, galvanized -steel butt- or pintle-type hinge system, and padlock hasps inside and outside.
 - 1. Provide two-point latch on lids larger than 84 inches.
- E. Safety Railing System: Roof-hatch manufacturer's standard system including rails, clamps, fasteners, safety barrier at railing opening, and accessories required for a complete installation; attached to roof hatch and complying with 29 CFR 1910.23 requirements and authorities having jurisdiction.
 - 1. Posts and Rails: Galvanized-steel pipe, 1-1/4 inches in diameter or galvanized-steel tube, 1-5/8 inches in diameter.
 - 2. Flat Bar: Galvanized steel, 2 inches high by 3/8 inch thick.
 - 3. Maximum Opening Size: System constructed to prevent passage of a sphere 21 inches in diameter.
 - 4. Chain Passway Barrier: Galvanized proof coil chain with quick link on fixed end.
 - 5. Self-Latching Gate: Fabricated of same materials and rail spacing as safety railing system. Provide manufacturer's standard hinges and self-latching mechanism.
 - 6. Post and Rail Tops and Ends: Weather resistant, closed or plugged with prefabricated end fittings.
 - 7. Provide weep holes or another means to drain entrapped water in hollow sections of handrail and railing members.
 - 8. Fabricate joints exposed to weather to be watertight.
 - 9. Fasteners: Manufacturer's standard, finished to match railing system.
 - 10. Finish: Manufacturer's standard.
 - a. Color: As selected by Architect from manufacturer's full range.
- F. Ladder-Assist Post: Roof-hatch manufacturer's standard device for attachment to roof-access ladder.
 - 1. Operation: Post locks in place on full extension; release mechanism returns post to closed position.
 - 2. Height: 42 inches above finished roof deck.
 - 3. Material: Steel tube Stainless steel Aluminum.
 - 4. Post: 1-5/8-inch- diameter pipe.
 - 5. Finish: Manufacturer's standard baked enamel or powder coat.
 - a. Color: As selected by Architect from manufacturer's full range.

2.3 ROOF ACCESS LADDER

- A. Roof Access Ladder: Provides permanent access to roof hatch. Aluminum ladder and components fabricated from 6061-T6 aluminum alloy. Fixed wall ladders include side rails with 1-1/8" (29 mm) round rungs that are serrated and secured with cast aluminum connectors, 4 solid rivets and 3/8" (9.5 mm) thick brackets mounted to the walls.
 - 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. Acudor Products, Inc.
 - b. AES Industries, Inc.
 - c. Babcock-Davis.
 - d. Bilco Company (The).
 - e. Bristolite Skylights.
 - f. Custom Solution Roof and Metal Products.
 - g. Dur-Red Products.
 - h. JL Industries, Inc.; a division of the Activar Construction Products Group.
 - i. KCC International Inc.
 - j. Lexcor; a division of Luxsuco corp.
 - k. Metallic Products Corp.
 - I. Milcor; Commercial Products Group of Hart & Cooley, Inc.
 - m. Nystrom, Inc.
 - n. O'Keeffe's Inc.
 - o. Williams Brothers Corporation of America.
- B. Security Door: Include 0.188" thick aluminum sheet with securing piano hinges and hasps
- C. Finish: Manufacturer's standard mill finish.
- 2.4 GENERAL FINISH REQUIREMENTS
 - A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
 - B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.
- B. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
- C. Verify dimensions of roof openings for roof accessories.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install roof accessories according to manufacturer's written instructions.
 - 1. Install roof accessories level; plumb; true to line and elevation; and without warping, jogs in alignment, buckling, or tool marks.
 - 2. Anchor roof accessories securely in place so they are capable of resisting indicated loads.
 - 3. Use fasteners, separators, sealants, and other miscellaneous items as required to complete installation of roof accessories and fit them to substrates.
 - 4. Install roof accessories to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.
- B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
 - 1. Coat concealed side of uncoated aluminum stainless-steel roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
 - 2. Underlayment: Where installing roof accessories directly on cementitious or wood substrates, install a course of underlayment and cover with manufacturer's recommended slip sheet.
 - 3. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof accessories for waterproof performance.
- C. Roof-Hatch Installation:
 - 1. Verify that roof hatch operates properly. Clean, lubricate, and adjust operating mechanism and hardware.
 - 2. Attach safety railing system to roof-hatch curb.
 - 3. Attach ladder-assist post according to manufacturer's written instructions.
- D. Seal joints with sealant as required by roof accessory manufacturer.

3.3 REPAIR AND CLEANING

- A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing according to ASTM A 780/A 780M.
- B. Touch up factory-primed surfaces with compatible primer ready for field painting according to Section 099113 "Exterior Painting."
- C. Clean exposed surfaces according to manufacturer's written instructions.
- D. Clean off excess sealants.
- E. Replace roof accessories that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 077200

SECTION 078413 - 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. Penetration firestopping systems for the following applications:
 - a. Penetrations in fire-resistance-rated walls.
 - b. Penetrations in horizontal assemblies.
- B. Related Requirements:
 - 1. Section 078443 "Joint Firestopping" for joints in or between fire-resistance-rated construction, at exterior curtain-wall/floor intersections, and in smoke barriers.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FM Approval according to FM Approval 4991, "Approval Standard for Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not install penetration firestopping system when ambient or substrate temperatures are outside limits permitted by penetration firestopping system manufacturers or when substrates are wet because of rain, frost, condensation, or other causes. B. Install and cure penetration firestopping materials 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 systems can be installed according to specified firestopping system design.
- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping systems.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics:
 - 1. Perform penetration firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
 - 2. Test per testing standards referenced in "Penetration Firestopping Systems" Article. Provide rated systems complying with the following requirements:
 - a. Penetration firestopping systems shall bear classification marking of a qualified testing agency.
 - 1) UL in its "Fire Resistance Directory."
 - 2) Intertek Group in its "Directory of Listed Building Products."
 - 3) FM Approval in its "Approval Guide."
 - 4) <Insert name of qualified testing and inspecting agency>.

2.2 PENETRATION FIRESTOPPING SYSTEMS

- A. Penetration Firestopping Systems: Systems that resist spread of fire, 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.
 - 1. Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. 3M Fire Protection Products.
 - b. Hilti, Inc.
 - c. Tremco, Inc.

- B. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined per ASTM E814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
 - 1. F-Rating: Not less than the fire-resistance rating of constructions penetrated.
- C. Penetrations in Horizontal Assemblies: Penetration firestopping systems with ratings determined per ASTM E814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
 - 1. F-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated.
 - 2. T-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
- D. Exposed Penetration Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, per ASTM E84.
- E. 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 system manufacturer and approved by qualified testing and inspecting agency for conditions indicated.
 - 1. Permanent forming/damming/backing materials.
 - 2. Substrate primers.
 - 3. Collars.
 - 4. Steel sleeves.

2.3 FILL MATERIALS

- A. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.
- B. Intumescent Putties: Nonhardening, water-resistant, intumescent putties containing no solvents or inorganic fibers.
- C. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.
- D. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants.
2.4 MIXING

A. Penetration Firestopping Materials: For those products requiring mixing before application, comply with penetration firestopping system 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: Before installing penetration firestopping systems, clean out openings immediately 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 materials.
 - 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping materials. Remove loose particles remaining from cleaning operation.
 - 3. Remove laitance and form-release agents from concrete.
- B. 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.

3.3 INSTALLATION

- A. General: Install penetration firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications.
- 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.

- 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not forming permanent components of firestopping.
- C. Install fill materials by proven techniques to produce the following results:
 - 1. Fill voids and cavities formed by openings, forming materials, accessories and penetrating items to achieve required fire-resistance ratings.
 - 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. Wall Identification: Permanently label walls containing penetration firestopping systems with the words "FIRE AND/OR SMOKE BARRIER PROTECT ALL OPENINGS," using lettering not less than 3 inches high and with minimum 0.375-inch strokes.
 - 1. Locate in accessible concealed floor, floor-ceiling, or attic space at 15 feet from end of wall and at intervals not exceeding 30 feet.
- B. Penetration Identification: Identify each penetration firestopping system with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of penetration firestopping system edge so labels are visible to anyone seeking to remove penetrating items or firestopping systems. 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 according to ASTM E2174.
- B. Where deficiencies are found or penetration firestopping system is damaged or removed because of testing, repair or replace penetration firestopping system to comply with requirements.
- C. Proceed with enclosing penetration firestopping systems 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 system 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 systems are 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 material and install new materials to produce systems complying with specified requirements.

3.7 PENETRATION FIRESTOPPING SYSTEM SCHEDULE

- A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHEZ.
- B. Where Intertek Group-listed systems are indicated, they refer to design numbers in Intertek Group's "Directory of Listed Building Products" under "Firestop Systems."
- C. Where FM Approval-approved systems are indicated, they refer to design numbers listed in FM Approval's "Approval Guide" under "Wall and Floor Penetration Fire Stops."
- D. Penetration Firestopping Systems with No Penetrating Items <Insert drawing designation>:
 - 1. UL-Classified Systems: [C-AJ-] [C-BJ-] [F-A-] [F-B-] [F-C-] [W-J-] [W-L-] <Insert four-digit number> [0001-0999].
 - 2. Intertek Group-Listed Systems: <Insert design numbers>.
 - 3. FM Approval-Approved Systems: <Insert design numbers>.
 - 4. F-Rating: [1 hour] [2 hours] < Insert number of hours>.
 - 5. T-Rating: [1 hour] [2 hours] < Insert number of hours>.
 - 6. L-Rating at Ambient: Less than <Insert cfm/sq. ft.>.
 - 7. L-Rating at 400 Deg F: Less than <Insert cfm/sq. ft.>.
 - 8. W-Rating: No leakage of water at completion of water leakage testing.
 - 9. Type of Fill Materials: [As required to achieve rating] < Insert material>.
- E. Penetration Firestopping Systems for Metallic Pipes, Conduit, or Tubing <Insert drawing designation>:
 - 1. UL-Classified Systems: [C-AJ-] [C-BJ-] [C-BK-] [F-A-] [F-B-] [F-C-] [F-E-] [W-J-] [W-K-] [W-L-] [W-N-] <Insert four-digit number> [1001-1999].
 - 2. Intertek Group-Listed Systems: <Insert design number>.
 - 3. FM Approval-Approved Systems: <Insert design number>.
 - 4. F-Rating: [1 hour] [2 hours] < Insert number of hours>.

- 5. T-Rating: [1 hour] [2 hours] < Insert number of hours>.
- 6. L-Rating at Ambient: Less than <Insert cfm/sq. ft.>.
- 7. L-Rating at 400 Deg F: Less than <Insert cfm/sq. ft.>.
- 8. W-Rating: No leakage of water at completion of water leakage testing.
- 9. Type of Fill Materials: [As required to achieve rating] < Insert material>.
- F. Penetration Firestopping Systems for Nonmetallic Pipe, Conduit, or Tubing <Insert drawing designation>:
 - 1. UL-Classified Systems: [C-AJ-] [C-BJ-] [C-BK-] [F-A-] [F-B-] [F-C-] [F-E-] [W-J-] [W-K-] [W-L-] [W-N-] <Insert four-digit number> [2001-2999].
 - 2. Intertek Group-Listed Systems: <Insert design number>.
 - 3. FM Approval-Approved Systems: <Insert design number>.
 - 4. F-Rating: [1 hour] [2 hours] < Insert number of hours>.
 - 5. T-Rating: [1 hour] [2 hours] < Insert number of hours>.
 - 6. L-Rating at Ambient: Less than <Insert cfm/sq. ft.>.
 - 7. L-Rating at 400 Deg F: Less than <Insert cfm/sq. ft.>.
 - 8. W-Rating: No leakage of water at completion of water leakage testing.
 - 9. Type of Fill Materials: [As required to achieve rating] < Insert material>.
- G. Penetration Firestopping Systems for Electrical Cables <Insert drawing designation>:
 - 1. UL-Classified Systems: [C-AJ-] [C-BJ-] [C-BK-] [F-A-] [F-B-] [F-C-] [F-E-] [W-J-] [W-K-] [W-L-] < Insert four-digit number> [3001-3999].
 - 2. Intertek Group-Listed Systems: <Insert design number>.
 - 3. FM Approval-Approved Systems: < Insert design number>.
 - 4. F-Rating: [1 hour] [2 hours] < Insert number of hours>.
 - 5. T-Rating: [1 hour] [2 hours] < Insert number of hours>.
 - 6. L-Rating at Ambient: Less than <Insert cfm/sq. ft.>.
 - 7. L-Rating at 400 Deg F: Less than <Insert cfm/sq. ft.>.
 - 8. W-Rating: No leakage of water at completion of water leakage testing.
 - 9. Type of Fill Materials: [As required to achieve rating] < Insert material>.
- H. Penetration Firestopping Systems for Cable Trays with Electric Cables <Insert drawing designation>:
 - 1. UL-Classified Systems: [C-AJ-] [C-BJ-] [F-A-] [F-B-] [F-C-] [W-J-] [W-K-] [W-L-] <Insert four-digit number> [4001-4999].
 - 2. Intertek Group-Listed Systems: <Insert design number>.
 - 3. FM Approval-Approved Systems: <Insert design number>.
 - 4. F-Rating: [1 hour] [2 hours] < Insert number of hours>.
 - 5. T-Rating: [1 hour] [2 hours] < Insert number of hours>.
 - 6. L-Rating at Ambient: Less than < Insert cfm/sg. ft.>.
 - 7. L-Rating at 400 Deg F: Less than <Insert cfm/sq. ft.>.
 - 8. W-Rating: No leakage of water at completion of water leakage testing.
 - 9. Type of Fill Materials: [As required to achieve rating] < Insert material>.
- I. Penetration Firestopping Systems for Insulated Pipes <Insert drawing designation>:
 - 1. UL-Classified Systems: [C-AJ-] [C-BJ-] [C-BK-] [F-A-] [F-B-] [F-C-] [F-E-] [W-J-] [W-L-] [W-N-] <Insert four-digit number> [5001-5999].
 - 2. Intertek Group-Listed Systems: <Insert design number>.
 - 3. FM Approval-Approved Systems: <Insert design number>.

PENETRATION FIRESTOPPING

- 4. F-Rating: [1 hour] [2 hours] < Insert number of hours>.
- 5. T-Rating: [1 hour] [2 hours] < Insert number of hours>.
- 6. L-Rating at Ambient: Less than <Insert cfm/sq. ft.>.
- 7. L-Rating at 400 Deg F: Less than <Insert cfm/sq. ft.>.
- 8. W-Rating: No leakage of water at completion of water leakage testing.
- 9. Type of Fill Materials: [As required to achieve rating] < Insert material>.
- J. Penetration Firestopping Systems for Miscellaneous Electrical Penetrants <Insert drawing designation>:
 - 1. UL-Classified Systems: [C-AJ-] [C-BJ-] [F-A-] [W-L-] [W-J-] <Insert four-digit number> [6001-6999].
 - 2. Intertek Group-Listed Systems: <Insert design number>.
 - 3. FM Approval-Approved Systems: <Insert design number>.
 - 4. F-Rating: [1 hour] [2 hours] < Insert number of hours>.
 - 5. T-Rating: [1 hour] [2 hours] < Insert number of hours>.
 - 6. L-Rating at Ambient: Less than <Insert cfm/sq. ft.>.
 - 7. L-Rating at 400 Deg F: Less than < Insert cfm/sg. ft.>.
 - 8. W-Rating: No leakage of water at completion of water leakage testing.
 - 9. Type of Fill Materials: [As required to achieve rating] <Insert material>.
- K. Penetration Firestopping Systems for Miscellaneous Mechanical Penetrants <Insert drawing designation>:
 - 1. UL-Classified Systems: [C-AJ-] [C-BJ-] [F-A-] [F-B-] [F-C-] [F-E-] [W-J-] [W-L-] [W-N-] <Insert four-digit number> [7001-7999].
 - 2. Intertek Group-Listed Systems: <Insert design number>.
 - 3. FM Approval-Approved Systems: <Insert design number>.
 - 4. F-Rating: [1 hour] [2 hours] < Insert number of hours>.
 - 5. T-Rating: [1 hour] [2 hours] < Insert number of hours>.
 - 6. L-Rating at Ambient: Less than <Insert cfm/sq. ft.>.
 - 7. L-Rating at 400 Deg F: Less than <Insert cfm/sq. ft.>.
 - 8. W-Rating: No leakage of water at completion of water leakage testing.
 - 9. Type of Fill Materials: [As required to achieve rating] < Insert material>.
- L. Penetration Firestopping Systems for Groupings of Penetrants <Insert drawing designation>:
 - 1. UL-Classified Systems: [C-AJ-] [C-BJ-] [F-A-] [F-B-] [F-C-] [F-E-] [W-J-] [W-L-] <Insert four-digit number> [8001-8999].
 - 2. Intertek Group-Listed Systems: <Insert design number>.
 - 3. FM Approval-Approved Systems: <Insert design number>.
 - 4. F-Rating: [1 hour] [2 hours] < Insert number of hours>.
 - 5. T-Rating: [1 hour] [2 hours] < Insert number of hours>.
 - 6. L-Rating at Ambient: Less than <Insert cfm/sq. ft.>.
 - 7. L-Rating at 400 Deg F: Less than < Insert cfm/sg. ft.>.
 - 8. W-Rating: No leakage of water at completion of water leakage testing.
 - 9. Type of Fill Materials: [As required to achieve rating] < Insert material>.

END OF SECTION 078413

PENETRATION FIRESTOPPING

SECTION 078443 - JOINT 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. Joints in or between fire-resistance-rated constructions.
- B. Related Requirements:
 - 1. Section 078413 "Penetration Firestopping" for penetrations in fire-resistance-rated walls, horizontal assemblies, and smoke barriers[and for wall identification].

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install joint firestopping systems when ambient or substrate temperatures are outside limits permitted by joint firestopping system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- B. Install and cure joint firestopping systems per manufacturer's written instructions using natural means of ventilation or, where this is inadequate, forced-air circulation.

1.5 COORDINATION

- A. Coordinate construction of joints to ensure that joint firestopping systems can be installed according to specified firestopping system design.
- B. Coordinate sizing of joints to accommodate joint firestopping systems.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics:
 - 1. Perform joint firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
 - 2. Test per testing standards referenced in "Joint Firestopping Systems" Article. Provide rated systems complying with the following requirements:
 - a. Joint firestopping systems shall bear classification marking of a qualified testing agency.
 - 1) UL in its "Fire Resistance Directory."
 - 2) Intertek Group in its "Directory of Listed Building Products."
 - 3) <Insert name of qualified testing agency>.

2.2 JOINT FIRESTOPPING SYSTEMS

- A. Joint Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which joint firestopping systems are installed. Joint firestopping systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases.
- B. Joints in or between Fire-Resistance-Rated Construction: Provide joint firestopping systems with ratings determined per ASTM E1966 or UL 2079.
 - 1. Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. 3M Fire Protection Products.
 - b. Hilti, Inc.
 - c. Tremco, Inc.
 - 2. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of the wall, floor, or roof in or between which it is installed.
- C. Exposed Joint Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E84.
- D. Accessories: Provide components of joint firestopping systems, including primers and forming materials, that are needed to install elastomeric fill materials and to maintain ratings required. Use only components specified by joint firestopping system manufacturer and approved by the qualified testing agency for conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

- A. Surface Cleaning: Before installing joint firestopping systems, clean joints immediately to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:
 - 1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of elastomeric fill materials or compromise fire-resistive rating.
 - 2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with elastomeric fill materials. Remove loose particles remaining from cleaning operation.
 - 3. Remove laitance and form-release agents from concrete.
- Prime substrates where recommended in writing by joint firestopping system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

3.3 INSTALLATION

- A. General: Install joint firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.
- B. Install forming materials and other accessories of types required to support elastomeric fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
 - 1. After installing elastomeric fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of fire-resistive joint system.
- C. Install elastomeric fill materials for joint firestopping systems by proven techniques to produce the following results:
 - 1. Elastomeric fill voids and cavities formed by joints and forming materials as required to achieve fire-resistance ratings indicated.

- 2. Apply elastomeric fill materials so they contact and adhere to substrates formed by joints.
- 3. For elastomeric 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. Joint Identification: Identify joint firestopping systems with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of joint edge so labels are visible to anyone seeking to remove or joint firestopping system. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
 - 1. The words "Warning Joint Firestopping Do Not Disturb. Notify Building Management of Any Damage."
 - 2. Contractor's name, address, and phone number.
 - 3. Designation of applicable testing agency.
 - 4. Date of installation.
 - 5. Manufacturer's name.
 - 6. Installer's name.

3.5 FIELD QUALITY CONTROL

- A. Inspecting Agency: Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E2393.
- B. Where deficiencies are found or joint firestopping systems are damaged or removed due to testing, repair or replace joint firestopping systems so they comply with requirements.
- C. Proceed with enclosing joint firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

- A. Clean off excess elastomeric fill materials adjacent to joints as the Work progresses by methods and with cleaning materials that are approved in writing by joint firestopping system manufacturers and that do not damage materials in which joints occur.
- B. Provide final protection and maintain conditions during and after installation that ensure joint firestopping systems are without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated joint firestopping systems immediately and install new materials to produce joint firestopping systems complying with specified requirements.

3.7 JOINT FIRESTOPPING SYSTEM SCHEDULE

- A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product [Category XHBN] [or] [Category XHDG].
- B. Where Intertek Group-listed systems are indicated, they refer to design numbers in Intertek Group's "Directory of Listed Building Products" under product category [Expansion/Seismic Joints] [or] [Firestop Systems].
- C. Floor-to-Floor, Joint Firestopping Systems[FRJS-<#>]:
 - 1. UL-Classified Systems: FF-[D] [S]-<Insert four-digit number> [0000-0999] [1000-1999] [2000-2999] [3000-3999] [4000-4999].
 - 2. Assembly Rating: [1 hour] [2 hours] < Insert number of hours>.
 - 3. Nominal Joint Width: [As indicated] <Insert dimension>.
 - 4. Movement Capabilities: [Class I] [Class II] [Class III] <Insert number> percent [compression or extension] [compression, extension, or horizontal shear].
 - 5. L-Rating at Ambient: Less than <Insert cfm/ft.>.
 - 6. L-Rating at 400 Deg F: Less than <Insert cfm/ft.>.
 - 7. W-Rating: No leakage of water at completion of water leakage testing.
- D. Wall-to-Wall, Joint Firestopping Systems[FRJS-<#>]:
 - 1. UL-Classified Systems: WW-[D] [S]-<Insert four-digit number> [0000-0999] [1000-1999] [2000-2999] [3000-3999] [4000-4999].
 - 2. Assembly Rating: [1 hour] [2 hours] < Insert number of hours>.
 - 3. Nominal Joint Width: [As indicated] < Insert dimension>.
 - 4. Movement Capabilities: [Class I] [Class II] [Class II] <Insert number> percent[compression or extension].
- E. Floor-to-Wall, Joint Firestopping Systems[FRJS-<#>]:
 - 1. UL-Classified Systems: FW-[D] [S]-<Insert four-digit number> [0000-0999] [1000-1999] [2000-2999] [3000-3999] [4000-4999].
 - 2. Assembly Rating: [1 hour] [2 hours] < Insert number of hours>.
 - 3. Nominal Joint Width: [As indicated] <Insert dimension>.
 - 4. Movement Capabilities: [Class I] [Class II] [Class III] <Insert number> percent [compression or extension] [compression, extension, or horizontal shear].
- F. Head-of-Wall, Fire-Resistive Joint Firestopping Systems[FRJS-<#>]:
 - 1. UL-Classified Systems: HW-[D] [S]-<Insert four-digit number> [0000-0999] [1000-1999] [2000-2999] [3000-3999] [4000-4999].
 - 2. Intertek Group-Listed Systems: <Insert design number>.
 - 3. Assembly Rating: [1 hour] [2 hours] < Insert number of hours>.
 - 4. Nominal Joint Width: [As indicated] < Insert dimension>.

- 5. Movement Capabilities: [Class I] [Class II] [Class III] <Insert number> percent[compression or extension].
- G. Bottom-of-Wall, Joint Firestopping Systems[FRJS-<#>]:
 - 1. UL-Classified Systems: BW-[D] [S]-<Insert four-digit number> [0000-0999] [1000-1999] [2000-2999] [3000-3999] [4000-4999].
 - 2. Assembly Rating: [1 hour] [2 hours] < Insert number of hours>.
 - 3. Nominal Joint Width: [As indicated] < Insert dimension>.
 - 4. Movement Capabilities: [Class I] [Class II] [Class II] <Insert number> percent[compression or extension].
- H. Wall-to-Wall, Joint Firestopping Systems Intended for Use as Corner Guards[FRJS-<#>]:
 - 1. UL-Classified Systems: CG-[D] [S]-<Insert four-digit number> [0000-0999] [1000-1999] [2000-2999] [3000-3999] [4000-4999].
 - 2. Assembly Rating: [1 hour] [2 hours] < Insert number of hours>.
 - 3. Nominal Joint Width: [As indicated] <Insert dimension>.
 - 4. Movement Capabilities: [Class I] [Class II] [Class II] <Insert number> percent[compression or extension].
- I. Perimeter Joint Firestopping Systems[PFRJS-<#>]:
 - 1. UL-Classified Perimeter Fire-Containment Systems: CW-[D] [S]-<Insert four-digit number> [0000-0999] [1000-1999] [2000-2999].
 - 2. Intertek Group-Listed, Perimeter Fire-Barrier Systems: <Insert design number>.
 - 3. Integrity Rating: [1 hour] [2 hours] < Insert number of hours>.
 - 4. Insulation Rating: [Zero hour] [1/4 hour] [3/4 hour] [1 hour] <Insert number of hours>.
 - 5. Linear Opening Width: [2-1/2 inches] [8 inches] [As indicated] <Insert dimension>, maximum.
 - 6. Movement Capabilities: [Class I] [Class II] [Class II] <Insert number> percent[compression or extension].

END OF SECTION 078443

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Silicone joint sealants.
 - 2. Nonstaining silicone joint sealants.
 - 3. Urethane joint sealants.
 - 4. Immersible joint sealants.
 - 5. Mildew-resistant joint sealants.
 - 6. Butyl joint sealants.
 - 7. Latex joint sealants.
- B. Related Requirements:
 - 1. Section 079100 "Preformed Joint Seals" for preformed compressible foam and precured joint seals.
 - 2. Section 321373 "Concrete Paving Joint Sealants" for sealing joints in paved roads, parking lots, walkways, and curbing.

1.3 ACTION 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. Joint-Sealant Schedule: Include the following information:
 - 1. Joint-sealant application, joint location, and designation.
 - 2. Joint-sealant manufacturer and product name.
 - 3. Joint-sealant formulation.
 - 4. Joint-sealant color.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

JOINT SEALANTS

B. Sample Warranties: For special warranties.

1.5 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[or are below 40 deg F].
 - 2. When joint substrates are wet.
 - 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
 - 4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.6 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 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. Low-Emitting Interior Sealants: Sealants and sealant primers shall comply with the testing and product requirements of the California Department of Health's (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- C. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 SILICONE JOINT SEALANTS

- A. 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 C 920, Type S, Grade NS, Class 50, Use NT.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Dow Corning Corporation; 791.
 - b. GE Construction Sealants; Momentive Performance Materials Inc; SCS2000 SilPruf.
 - c. May National Associates, Inc., a subsidiary of Sika Corporation U.S.; Bondaflex Sil 265 LTS.
 - d. Pecora Corporation; PCS.
 - e. Sika Corporation U.S.; [Sikasil WS-295] [Sikasil WS-295 FPS].
- B. Silicone, S, NS, 50, T, NT: Single-component, nonsag, plus 50 percent and minus 50 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Uses T and NT.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Dow Corning Corporation; [799] [CCS].
 - b. Soudal USA; RTV 50.

2.3 NONSTAINING SILICONE JOINT SEALANTS

- A. Nonstaining Joint Sealants: No staining of substrates when tested according to ASTM C 1248.
- B. 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 C 920, Type S, Grade NS, Class 50, Use NT.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

- a. Dow Corning Corporation; 756 SMS.
- b. GE Construction Sealants; Momentive Performance Materials Inc; SilPruf NB.
- c. May National Associates, Inc., a subsidiary of Sika Corporation U.S.; Bondaflex Sil 295 FPS NB.
- d. Pecora Corporation; 864NST.
- e. Tremco Incorporated; Spectrem 2.

2.4 URETHANE JOINT SEALANTS

- A. Urethane, M, NS, 50, NT: Multicomponent, nonsag, plus 50 percent and minus 50 percent movement capability nontraffic-use, urethane joint sealant; ASTM C 920, Type M, Grade NS, Class 50, Use NT.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Pecora Corporation; Dynatrol II.

2.5 IMMERSIBLE JOINT SEALANTS

- A. Urethane, Immersible, M, NS, 50, T, NT, I: Immersible, multicomponent, nonsag, plus 50 percent and minus 50 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type M, Grade NS, Class 50, Uses T, NT, and I.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. LymTal International, Inc.; Iso-Flex 881R.
 - b. Tremco Incorporated; Dymeric 240 FC.

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 C 920, Type S, Grade NS, Class 25, Use NT.
- 2.7 BUTYL JOINT SEALANTS
 - A. Butyl-Rubber-Based Joint Sealants: ASTM C 1311.

- 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Bostik, Inc.; Chem-Calk 300.
 - b. Pecora Corporation; BC-158.

2.8 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.
 - 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. BASF Construction Chemicals Building Systems.
 - b. Construction Foam Products, a division of Nomaco, Inc.

2.9 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 C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of sealant backings.
 - 2. Do not stretch, twist, puncture, or tear sealant backings.
 - 3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 - 1. Remove excess sealant from surfaces adjacent to joints.
 - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 - 3. Provide concave joint profile per Figure 8A in ASTM C 1193 unless otherwise indicated.
 - 4. Provide flush joint profile at locations indicated on Drawings according to Figure 8B in ASTM C 1193.
 - 5. Provide recessed joint configuration of recess depth and at [locations indicated on Drawings] <Insert locations> according to Figure 8C in ASTM C 1193.
 - a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

3.4 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.6 JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces.
 - 1. Joint Locations:
 - a. Control and expansion joints in brick pavers.
 - b. Isolation and contraction joints in cast-in-place concrete slabs.
 - c. Tile control and expansion joints.
 - d. Joints between different materials listed above.
 - e. Other joints as indicated on Drawings.
 - 2. Joint Sealant: Single-Component, Nonsag, Silicone joint sealant:ASTM D 5893/D 5893M, Type SL..
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- B. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces subject to water immersion.
 - 1. Joint Locations:
 - a. Joints in pedestrian plazas.
 - b. Joints in swimming pool decks.
 - c. Other joints as indicated on Drawings.
 - 2. Joint Sealant: Urethane, immersible, S, P, 25, T, NT, I.
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- C. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces.
 - 1. Joint Locations:
 - a. Construction joints in cast-in-place concrete.
 - b. Control and expansion joints in unit masonry.
 - c. Joints in exterior insulation and finish systems.
 - d. Joints between metal panels.
 - e. Joints between different materials listed above.

- f. Perimeter joints between materials listed above and frames of doors, windows, and louvers.
- g. Control and expansion joints in ceilings and other overhead surfaces.
- h. Other joints as indicated on Drawings.
- 2. Joint Sealant: Silicone, nonstaining, S, NS, 50, NT.
- 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors .
- D. Joint-Sealant Application: Interior joints in horizontal traffic surfaces.
 - 1. Joint Locations:
 - a. Isolation joints in cast-in-place concrete slabs.
 - b. Control and expansion joints in tile flooring.
 - c. Other joints as indicated on Drawings.
 - 2. Joint Sealant: Urethane, S, P, 25, T, NT.
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- E. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces.
 - 1. Joint Locations:
 - a. Control and expansion joints on exposed interior surfaces of exterior walls.
 - b. Tile control and expansion joints.
 - c. Vertical joints on exposed surfaces of unit masonry, concrete, walls, and partitions.
 - d. Other joints as indicated on Drawings.
 - 2. Joint Sealant: Urethane, S, NS, 25, NT.
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- F. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces.
 - 1. Joint Locations:
 - a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
 - b. Tile control and expansion joints where indicated.
 - c. Other joints as indicated on Drawings.
 - 2. Joint Sealant: Silicone, mildew resistant, acid curing, S, NS, 25, NT.
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- G. Joint-Sealant Application: Concealed mastics.
 - 1. Joint Locations:

JOINT SEALANTS

- a. Aluminum thresholds.
- b. Sill plates.
- c. Other joints as indicated on Drawings.
- 2. Joint Sealant: Butyl-rubber based.
- 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

END OF SECTION 079200

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes hollow-metal work.
- B. Related Requirements:
 - 1. Section 087100 "Door Hardware" for door hardware for hollow-metal doors.

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 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, core descriptions, fire-resistance 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.

HOLLOW METAL DOORS AND FRAMES

- 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. Samples for Initial Selection: For units with factory-applied color finishes.
- D. Schedule: Provide a schedule of hollow-metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final Door Hardware Schedule.
- 1.6 INFORMATIONAL SUBMITTALS
 - A. Product Test Reports: For each type of hollow-metal door and frame assembly, for tests performed by a qualified testing agency.
- 1.7 DELIVERY, STORAGE, AND HANDLING
 - A. Deliver hollow-metal work palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
 - 1. Provide additional protection to prevent damage to factory-finished units.
 - B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
 - C. Store hollow-metal work vertically under cover at Project site with head up. Place on minimum 4-inch- high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Ceco Door; ASSA ABLOY.
 - 2. Curries Company; ASSA ABLOY.
 - 3. Hollow Metal Inc.
 - 4. Republic Doors and Frames.
- B. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.

2.2 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 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, 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: Knocked down.
- C. Exposed Finish: Prime.

2.3 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 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 A40 coating.
 - d. Edge Construction: Model 1, Full Flush .
 - e. Core: Manufacturer's standard vertical steel-stiffener core .
 - 3. Frames:

- a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch, with minimum A40 coating.
- b. Construction: Knocked down
- 4. Exposed Finish: Prime.

2.4 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.

2.5 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.

HOLLOW METAL DOORS AND FRAMES

- F. Grout: ASTM C 476, except with a maximum slump of 4 inches, as measured according to ASTM C 143/C 143M.
- G. 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.
- H. Glazing: Comply with requirements in Section 088000 "Glazing."
- I. 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.

2.6 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: Bevel edges 1/8 inch in 2 inches.
 - 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. 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.
 - 6. 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. 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) Four anchors per jamb from 60 to 90 inches high.
 - c. Compression Type: Not less than two anchors in each frame.
 - d. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.
- 6. Head Anchors: Two anchors per head for frames more than 42 inches wide and mounted in metal-stud partitions.
- 7. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
 - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
 - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- 8. Terminated Stops: Terminate stops 6 inches above finish floor with a 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 butted 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.

2.7 STEEL FINISHES

- A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
 - 1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

2.8 ACCESSORIES

- A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.
- B. Grout Guards: Formed from same material as frames, not less than 0.016 inch thick.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. 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.
 - g. Field apply bituminous coating to backs of frames that will be filled with grout containing antifreezing agents.
 - 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
 - a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
 - 3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation inside frames.
 - 4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
 - 5. 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: 5/8 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.
- D. Glazing: Comply with installation requirements in Section 088000 "Glazing" and with hollow-metal manufacturer's written instructions.
 - 1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.
- B. Remove grout and other bonding material from hollow-metal work immediately after installation.
- C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

- D. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.
- E. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION 081113

SECTION 081416 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Five-ply flush wood veneer-faced doors[and transom panels] for transparent finish.
 - 2. Five-ply flush wood doors for opaque finish.
 - 3. Factory flush wood doors and frames.
 - 4. Factory fitting flush wood doors to frames and factory machining for hardware.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product, including the following:
 - 1. Door core materials and construction.
 - 2. Door edge construction
 - 3. Door face type and characteristics.
 - 4. Door trim for openings.
 - 5. Door frame construction.
 - 6. Factory-machining criteria.
 - 7. Factory-specifications.
- B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each type of door; construction details not covered in Product Data; and the following:
 - 1. Door schedule indicating door[and frame] location, type, size, fire protection rating, and swing.
 - 2. Door elevations, dimension and locations of hardware, lite and louver cutouts, and glazing thicknesses.
 - 3. Details of frame for each frame type, including dimensions and profile.
 - 4. Details of electrical raceway and preparation for electrified hardware, access control systems, and security systems.
 - 5. Dimensions and locations of blocking for hardware attachment.
 - 6. Dimensions and locations of mortises and holes for hardware.
 - 7. Clearances and undercuts.
 - 8. Requirements for veneer matching.
 - 9. Doors to be factory primed and application requirements.
 - 10. Apply AWI Quality Certification Program label to Shop Drawings.

1.4 QUALITY ASSURANCE

A. Manufacturer's Certification: Licensed participant in AWI's Quality Certification Program.

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.
- C. Mark each door on bottom rail with opening number used on Shop Drawings.

1.6 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and HVAC system is operating and maintaining temperature and relative humidity at levels designed for building occupants for the remainder of construction period.
- B. Environmental Limitations: Do not deliver or install doors until building is enclosed and weathertight, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between [25 and 55]
 [43 and 70] [17 and 50] <Insert numbers> percent during remainder of construction period.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain flush wood doors from single manufacturer.
- 2.2 FLUSH WOOD DOORS AND FRAMES, GENERAL
 - A. Quality Standard: In addition to requirements specified, comply with AWI/AWMAC/WI's "Architectural Woodwork Standards."
 - 1. Provide labels from AWI certification program indicating that doors and frames comply with requirements of grades specified.

- a. This project has been registered with AWI as AWI Quality Certification Program Number <Insert number>.
- b. Contractor shall register the Work under this Section with the AWI Quality Certification Program at www.awiqcp.org or by calling 855-345-0991.
- 2. The Contract Documents contain requirements that are more stringent than the referenced quality standard. Comply with the Contract Documents in addition to those of the referenced quality standard.

2.3 SOLID-CORE FIVE-PLY FLUSH WOOD VENEER-FACED DOORS FOR TRANSPARENT FINISH

- A. Interior Doors (Amenity Building A7) :
 - 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. Eggers Industries.
 - b. Lambton Doors.
 - c. Oshkosh Door Company.
 - d. VT Industries Inc.
 - 2. Performance Grade:
 - a. ANSI/WDMA I.S. 1A Heavy Duty unless otherwise indicated on Drawings.
 - 3. ANSI/WDMA I.S. 1A Grade: .
 - 4. Faces: Single-ply wood veneer not less than 1/50 inch thick.
 - a. Species: White oak.
 - b. Cut: Rift cut.
 - c. Match between Veneer Leaves: Slip match.
 - d. Assembly of Veneer Leaves on Door Faces: Balance match.
 - e. Room Match: Provide door faces of compatible color and grain within each separate room or area of building.
 - 5. Exposed Vertical Edges: Applied wood-veneer edges of same species as faces and covering edges of faces - Architectural Woodwork Standards edge Type B.
 - a. Fire-Rated Single Doors: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed vertical edges.
 - 6. Core for Non-Fire-Rated Doors:
 - a. ANSI A208.1, Grade LD-1 particleboard.
 - a) 5-inch top-rail blocking, in doors indicated to have closers.
 - b) 5-inch bottom-rail blocking, in exterior doors and doors indicated to have kick, mop, or armor plates.

- c) 5-inch midrail blocking, in doors indicated to have exit devices.
- 7. Construction: Five plies, hot-pressed bonded (vertical and horizontal edging is bonded to core), with entire unit abrasive planed before veneering.

2.4 SOLID-CORE FIVE-PLY FLUSH WOOD DOORS FOR OPAQUE FINISH

- A. Interior Solid-Core Doors (All dwelling unit interior doors):
 - 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. Eggers Industries.
 - b. Lambton Doors.
 - c. Oshkosh Door Company.
 - d. VT Industries Inc.
 - 2. Performance Grade: ANSI/WDMA I.S. 1A Standard Duty.
 - 3. Faces: Hardboard or MDF.
 - 4. Exposed Vertical and Top Edges: Any closed-grain hardwood.
 - 5. Core for Non-Fire-Rated Doors:
 - a. ANSI A208.1, particleboard.
 - Blocking: Provide wood blocking in particleboard-core doors as needed to eliminate through-bolting hardware.
 - a) 5-inch top-rail blocking, in doors indicated to have closers.
 - b) 5-inch bottom-rail blocking, in exterior doors and doors indicated to have kick, mop, or armor plates.
 - c) 5-inch midrail blocking, in doors indicated to have exit devices.
 - 6. Construction: Five plies, hot-pressed bonded (vertical and horizontal edging is bonded to core), with entire unit abrasive planed before veneering.

2.5 FABRICATION

- A. Factory fit doors to suit frame-opening sizes indicated.
 - 1. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
 - 2. Comply with NFPA 80 requirements for fire-rated doors.
- B. Factory machine doors for hardware that is not surface applied.

- 1. Locate hardware to comply with DHI-WDHS-3.
- 2. Comply with final hardware schedules, door frame Shop Drawings, ANSI/BHMA-156.115-W, and hardware templates.
- 3. Coordinate with hardware mortises in metal frames, to verify dimensions and alignment before factory machining.
- 4. For doors scheduled to receive electrified locksets, provide factory-installed raceway and wiring to accommodate specified hardware.
- 5. Metal Astragals: Factory machine astragals and formed-steel edges for hardware for pairs of fire-rated doors.
- C. 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, rabbeted, meeting rails.
 - 4. Provide factory-installed spring bolts for concealed attachment into jambs of metal door frames.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and installed door frames, with Installer present, before hanging doors.
 - 1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
 - 2. Reject doors with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Hardware: For installation, see Section 087100 "Door Hardware."
- B. Install doors and frames to comply with manufacturer's written instructions and referenced quality standard, and as indicated.
- C. Install frames level, plumb, true, and straight.
 - 1. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.
- 2. Anchor frames to anchors or blocking built in or directly attached to substrates.
 - a. Secure with countersunk, concealed fasteners and blind nailing.
 - b. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork.
 - 1) For factory-finished items, use filler matching finish of items being installed.
- 3. Install smoke- and draft-control doors in accordance with NFPA 105.
- D. Job-Fitted Doors:
 - 1. Align and fit doors in frames with uniform clearances and bevels as indicated below.
 - a. Do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors.
 - 2. Machine doors for hardware.
 - 3. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
 - 4. Clearances:
 - a. Provide 1/8 inch at heads, jambs, and between pairs of doors.
 - b. Provide 1/8 inch from bottom of door to top of decorative floor finish or covering unless otherwise indicated on Drawings.
 - c. Where threshold is shown or scheduled, provide1/4 inch from bottom of door to top of threshold unless otherwise indicated.
 - d. Comply with NFPA 80 for fire-rated doors.
 - 5. Bevel non-fire-rated doors 1/8 inch in 2 inches at lock and hinge edges.
 - 6. Bevel fire-rated doors 1/8 inch in 2 inches at lock edge; trim stiles and rails only to extent permitted by labeling agency.
- E. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- F. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 FIELD QUALITY CONTROL

- A. Inspections:
 - 1. Provide inspection of installed Work through AWI's Quality Certification Program, certifying that wood doors and frames, including installation, comply with requirements of AWI/AWMCA/WI's "Architectural Woodwork Standards" for the specified grade.
 - 2. Fire-Rated Door Inspections: Inspect each fire-rated door in accordance with NFPA 80, Section 5.2.

- 3. Egress Door Inspections: Inspect each door equipped with panic hardware, each door equipped with fire exit hardware, each door located in an exit enclosure, each electrically controlled egress door, and each door equipped with special locking arrangements in accordance with NFPA 101, Section 7.2.1.15.
- B. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.
- C. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.
- D. Prepare and submit separate inspection report for each fire-rated door assembly indicating compliance with each item listed in NFPA 80.

3.4 ADJUSTING

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 081416

SECTION 081433.13 - WOOD TERRACE 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. Aluminum-clad hinged wood-framed glass doors.
- B. Related Requirements:
 - 1. Section 087100 "Door Hardware" for hardware not specified in Section 081436.
 - 2. for on-site finishing of unfinished hinged wood-framed glass doors.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of hinged wood-framed glass door.
 - 1. Include construction details, material descriptions, fabrication methods, dimensions of individual components and profiles, hardware, finishes, and operating instructions.
- B. Shop Drawings: For hinged wood-framed glass doors.
 - 1. Include plans, elevations, sections, and details.
 - 2. Detail attachments to other work, and between units, if any.
 - 3. Include hardware and required clearances.
- C. Samples: For each type of hinged wood-framed glass door and for each color and texture specified, 12-inch-long section with weather stripping, glazing bead, and factory-applied color finish.

1.4 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For [finishes,]weather stripping, operable panels, and operating hardware to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An installer acceptable to hinged wood-framed glass door manufacturer for installation of units required for this Project.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain hinged wood-framed glass doors from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Product Standard: Comply with AAMA/WDMA/CSA 101/I.S.2/A440 for minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.
 - 1. Product Certification: AMMA certified with label attached to each door.
- B. Thermal Transmittance: NFRC 100 maximum total fenestration product U-factor of 0.32 Btu/sq. ft. x h x deg F.
- C. Solar Heat-Gain Coefficient (SHGC): NFRC 200 maximum total fenestration product SHGC of 0.30.
- D. Sound Transmission Class (STC): Rated for not less than 28 STC when tested for laboratory sound transmission loss according to ASTM E 90 and determined by ASTM E 413.
- E. Outside-Inside Transmission Class (OITC): Rated for not less than 23 OITC when tested for laboratory sound transmission loss according to ASTM E 90 and determined by ASTM E 1332.
- F. Windborne-Debris Impact Resistance: Passes ASTM E 1886 missile-impact and cyclic-pressure tests in accordance with ASTM E 1996 for Wind Zone 3 for basic protection.

2.3 ALUMINUM-CLAD HINGED WOOD-FRAMED GLASS DOORS

- A. Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - 1. Jeld-Wen, Inc.
 - 2. Marvin Windows and Doors.
 - 3. Pella Corporation.
 - 4. Sierra Pacific Windows; Sierra Pacific Industries.
 - 5. PlyGem
- B. Exterior Surfaces: Aluminum cladding with manufacturer's standard fluoropolymer two-coat system with fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight and complying with AAMA 2605.
 - 1. Color: As selected by Architect from manufacturer's full range.
- C. Interior Surfaces: Manufacturer's standard stain-and-varnish finish.
 - 1. Wood Species: Manufacturer's standard species.
- D. Frames and Door Panels: Fabricate from wood components complying with indicated requirements. Provide factory-assembled door panels with narrow-profile stiles and frames.
- E. Wood Components: Manufacturer's standard LVL or fine-grained wood lumber complying with AAMA/WDMA/CSA 101/I.S.2/A440; kiln dried to a moisture content of not more than 12 percent at time of fabrication; free of visible finger joints, blue stain, knots, pitch pockets, and surface checks larger than 1/32 inch deep by 2 inches wide; water-repellent preservative treated.
- F. Mullions: Provide mullions and mullion casing and cover plates as shown, matching door units, complete with anchors for support to structure and installation of hinged wood-framed glass door units. Allow for erection tolerances and provide for movement of door units due to thermal expansion and building deflections, as indicated. Provide mullions and cover plates capable of withstanding design loads of door units.
- G. Drip Caps: Extruded aluminum, factory fabricated and finished to match door frame; designed to direct water away from building when installed horizontally at head of hinged wood-framed glass doors.
- H. Threshold: Provide extruded aluminum threshold of thickness, dimensions, and profile indicated; designed to comply with performance requirements indicated and to drain to exterior.

- 1. Color: Black.
- 2. Low-Profile Threshold: ADA-ABA compliant.

2.4 FABRICATION

- A. Fabricate hinged wood-framed glass doors in sizes indicated. Include a complete system for assembling components and anchoring doors.
- B. Fabricate hinged wood-framed glass doors that are reglazable without dismantling panel framing.
- C. Weather Stripping: Provide full-perimeter weather stripping for each door panel unless otherwise indicated.
- D. Factory machine hinged wood-framed glass doors for openings and hardware that is not surface applied.
- E. Complete fabrication, assembly, finishing, hardware application, and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation. Allow for scribing, trimming, and fitting at Project site.
- F. Factory-Glazed Fabrication: Glaze hinged aluminum-framed glass doors in the factory.

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 Work.
- B. Verify rough opening dimensions, levelness of threshold substrate, and operational clearances.
- C. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure a coordinated, weathertight hinged door installation.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with Drawings, Shop Drawings, and manufacturer's written instructions for installing hinged doors, hardware, accessories, and other components.

- B. Install hinged wood-framed glass doors level, plumb, square, true to line; without distortion, warp, or rack of frames and panels, and without impeding thermal movement; anchored securely in place to structural support; and in proper relation to wall flashing, vapor retarders, air barriers, water/weather barriers, and other adjacent construction. Comply with ASTM E 2112.
- C. Set sill members in bed of sealant or with gaskets, as indicated, to provide weathertight construction.
- D. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials according to ASTM E 2112.

3.3 ADJUSTING, CLEANING, AND PROTECTION

- A. Lubricate hardware and moving parts.
- B. Adjust operating panels and screens to provide a tight fit at contact points and weather stripping for smooth operation, without binding, and weathertight closure.
- C. Adjust hardware for proper alignment, smooth operation, and proper latching without unnecessary force or excessive clearance.
- D. Clean exposed surfaces immediately after installing hinged wood-framed glass doors. Avoid damaging protective coatings and finishes. Remove nonpermanent labels, excess sealants, glazing materials, dirt, and other substances.
- E. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.
- F. Protect hinged wood-framed glass door surfaces from contact with contaminating substances resulting from construction operations. If contaminating substances contact hinged wood-framed glass door surfaces, remove contaminants immediately according to manufacturer's written instructions.
- G. Refinish or replace hinged doors with damaged finishes.
- H. Replace damaged components.

END OF SECTION 081433.13

SECTION 081613 - FIBERGLASS ENTRY DOORS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Fiberglass Entry Doors
- B. Impact Resistant Fiberglass Entry Doors
- C. Fire Rated Fiberglass Entry Doors

1.2 RELATED SECTIONS

- A. 06 40 00 Architectural Woodwork
- B. 07 27 00 Air Barriers: Water-resistant barrier
- C. 07 92 00 Joint Sealants: Sealants and caulking
- D. 08 80 00 Glazing
- E. 08 71 00 Door Hardware
- F. 09 90 00 Painting and Coating

1.3 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - 1. ASTM E 90 Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions.
 - 2. ASTM E 283 Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors Under Specified Pressure Difference Across the Specimen.
 - 3. ASTM E 330 Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
 - 4. ASTM E 331 Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
 - 5. ASTM E 413 Classification for Rating Sound Insulation (STC).
 - 6. ASTM E 547 Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Cyclic Static Air Pressure Difference.
 - 7. ASTM E 1332 Standard Classification for Determination of Outdoor-Indoor Transmission Class.
 - 8. ASTM E 1886 Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Missiles and Exposed to Cyclic Pressure Differentials.
 - 9. ASTM E 1996 Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes.

- 10. ASTM E 2235 Standard Test Method for Determination of Decay Rates for Use in Sound Insulation Test Methods.
- B. Code of Federal Regulations:
 - 1. CFR 1201 Part 2 Safety Standard for Architectural Glazing Materials.
- C. National Fenestration Rating Council
 - 1. NFRC 100 Procedure for Determining Fenestration Product U-Factors.
 - 2. NFRC 200 Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance (VT) at Normal Incidence.
 - 3. NFRC 400 Procedure for Determining Fenestration Product Air Leakage.
- D. National Fire Protection Association
 - 1. NFPA 252 Standard Methods of Fire Tests of Door Assemblies
- E. Underwriters Laboratory
 - 1. UL 10B Standard for Fire Testing Door Assemblies.
 - 2. UL 10C Standard for Positive Pressure Fire Tests of Door Assemblies.

1.4 PERFORMANCE REQUIREMENTS

- A. Door Unit Air Leakage, NFRC 400, 1.57 psf (25 mph): 0.50 cfm per square foot of frame or less. Door Unit Water Penetration: No water penetration through door unit when tested in accordance with ASTM E 331or ASTM E 547 with water applied at rate of 5 gallons per hour per square foot at
- B. Doors shall have a minimum STC rating of 26 or a minimum OITC rating of 24.
- C. Doors shall have a positive pressure certified fire door rating of 20 minutes.
- D. Doors shall have a minimum/maximum U-Value of .77 and a minimum/maximum SHGC of .25.
- E. Doors shall qualify for Energy Star Rating.

1.5 SUBMITTALS

- A. Refer to Division 01 33 00 Submittal Procedures [Insert division number and title].
- B. Product Data: Submit door manufacturer current product literature, including installation instructions.
- C. Shop Drawings: Submit manufacturer's shop drawings, indicating dimensions, construction, component connections, anchorage methods and locations, accessories, hardware locations, and installation details.
- D. Samples: Submit full-size or partial full-size verification sample of door illustrating glazing system, quality of construction, texture, and color of finish.

1.6 QUALITY ASSURANCE

- A. Mockup:
 - 1. Provide sample unit of representative product size and using manufacturer approved installation methods to determine acceptability of door installation methods. Comply with Division 01 43 39 Quality Assurance
 - 2. Approved mockup shall represent minimum quality required for the Work.
 - 3. Approved mockup shall [not] remain in place within the Work.
- B. Quality Assurance Submittals:
 - 1. Provide documentation for specified performance as required.
 - 2. Manufacturers¢installation instructions.
- C. Manufacturer Qualifications: Manufacturer shall have successful experience in producing the type of product required for project applications equivalent to the requirements for this project.
- D. Installer Qualifications:
 - 1. Optional: Installer holds current credential as a NAMI Certified Installer of ThermaTru Side Hinged Door Installations and as a Therma-Tru® Certified Installer.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Refer to Division 01 60 00 Product Requirements.
- B. Delivery: Deliver materials to site undamaged with labels clearly identifying manufacturer, product name, and installation instructions
- C. Storage: Store materials in an upright position, off ground, under cover, and protected from weather, direct sunlight, and construction activities.
- D. Handling: protect materials and finish during handling and installation to prevent damage.

1.8 WARRANTY

- A. Refer to Division 01 78 36 Warranties
- B. Therma-Tru®standard limited warranty for fiberglass Therma-Tru®Door Product and genuine Therma-Tru®components, including rot-resistant frames, mullions, and brickmould sourced from Therma-Tru (excluding primed pine door frames and oak door frames, and non-rot resistant mullions and brickmould) used in commercial and multi residential projects will be free from material and workmanship defects for a period of three years subject to certain limitations and restrictions. For complete details and current warranty information go to www.thermatru.com.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Basis of design: Therma-Tru Corp. Indian Wood Circle Maumee, OH 43537 (419) 891-7400 (800) 843-7628
- B. Requests for substitutions will be considered in accordance with provisions of Division 01 60 00.

2.2 FIBERGLASS ENTRY DOORS

- A. Fiberglass Entry Doors: All fiberglass doors manufactured by Therma-Tru®.Specification is for complete entry systems with components manufactured by Therma-Tru® and assembled by independent fabricators.
 - 1. Select, ®, [Smooth-Star®], [20 Min Fire Door]
 - 2. Construction:
 - a. Smooth Star® 1/16-inch minimum thickness, proprietary fiberglass-reinforced thermoset composite, surface lightly textured. Door edges are machinable kiln-dried pine, primed, lock edge reinforced with engineered lumber core, lockset area reinforced with solid blocking for hardware backup. Door bottom edge is moisture- and decayresistant composite. Core is foamed-in-place polyurethane, density 1.9 pcf minimum.
 - 3. Door Style
 - a. Smooth-Star®
 - 1) Style No S2600, Onyx
 - 2) Style No SSF100 (20-Minute), Onyx
- B. Frames: Provided and assembled by third party fabricators to exacting specifications from Therma-Tru to help maximize system performance. Therma-Tru®strongly recommends the use of rot-resistant frames, mullions, and brickmould sourced from Therma-Tru, however, the use of a non Therma-Tru® frame system (or a Therma-Tru Primed Pine Frame or Therma-Tru Oak Frame) will not automatically void the entire limited warranty. Refer to 1.8.B for clarification.
 - 1. Milled from 5/4 kiln-dried material with profiled ½-stop and 6 degree sill gain prep.
 - 2. Jamb Width Optional: 6 9/16•
 - 3. Rot Resistant frames, mullions, and brickmould sourced through Therma-Tru.
- C. Sills
 - 1. Inswing: Basic Composite Adjustable

- 2. Other: [Public Access Sill]
- 3. Finish: Satin nickel

2.3 HARDWARE

- A. Hinges: Steel, 4 x 4 x 0.098 inches finished to match hardware, plated screws to match
 - 1. Finish: US17A, black nickel
- B. Locking Hardware:
 - 1. Multi-point lock system handle set hardware: Millennium
 - 2. Finish: US15, brushed nickel US17A, black nickel

2.4 GLAZING

- A. Therma-Tru factory glazed with double-pane construction.
- 2.5 INSTALLATION ACCESSORIES
 - A. Sill pan
 - B. Corner seal pad
 - C. Rain deflector
 - D. Rain Guard

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive doors. Notify Architect in writing any unacceptable conditions that would adversely affect installation or subsequent performance of the product. Do not proceed with installation until unsatisfactory conditions are corrected.

3.2 INSTALLATION

- A. Install fiberglass doors in full compliance with Therma-Tru®written instructions and approved shop drawings.
- B. Install 20 minute doors with permanent fire door certification label in compliance with the requirements of the labeling agency and NFPA.
- C. Maintain alignment and compatibility with adjacent work.

FIBERGLASS ENTRY DOORS

3.3 FINISHING

- A. Finish in compliance with Therma-Tru®written recommendations. Guidance for proper finishing is available at www.thermatru.com -Recommendations for Proper Finishing and Painting or Staining.•
- 3.4 Protection
 - A. Protect installed products until completion of project.
 - B. Touch-up, repair or replace damaged products prior to Substantial Completion in accordance with Therma-Tru written recommendations. Guidance for proper finishing is available at www.thermatru.com Recommendations for Proper Finishing and Painting or Staining.•

END OF SECTION

SECTION 083100 - ACCESS DOORS, PANELS, AND HATCHES GENERAL

1.1 SECTION INCLUDES

A. Fire-rated access doors. (MFRU) (MPFR) (MPFR-DW)

1.2 RELATED SECTIONS

- A. Section 055000 Metal Fabrications.
- B. Section 061000 Rough Carpentry.
- C. Section 092413 Adobe Finish Portland Cement Plaster.
- D. Section 092313 Acoustical Gypsum Plastering Gypsum Plaster.
- E. Section 099000 Painting and Coating.

1.3 REFERENCES

- A. American National Standards Institute (ANSI):
 - 1. ANSI-UL 10B Standard for Fire Tests of Door Assemblies.
- B. Underwriters Laboratories (UL).
- C. Underwriters Laboratories Canada (ULc).

1.4 SUBMITTALS

- A. Submit under provisions of Section 013000 Administrative Requirements.
- B. Product Data:
 - 1. Manufacturer's data sheets on each product to be used.
 - 2. Preparation instructions and recommendations.
 - 3. Storage and handling requirements and recommendations.
 - 4. Typical installation methods.
- C. Verification Samples: Two representative units of each type, size, pattern, and color.
- D. Shop Drawings: Include details of materials, construction, and finish. Include relationship with adjacent construction.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with a minimum five years documented experience.
- B. Installer Qualifications: Company specializing in performing Work of this section with minimum two years documented experience with projects of similar scope and complexity.
- C. Source Limitations: Provide each type of product from a single manufacturing source to ensure uniformity.
- D. Mock-Up: Construct a mock-up with actual materials in sufficient time for Architect's review and to not delay construction progress. Locate mock-up as acceptable to Architect and provide temporary foundations and support.
 - 1. Intent of mock-up is to demonstrate quality of workmanship and visual appearance.
 - 2. If mock-up is not acceptable, rebuild mock-up until satisfactory results are achieved.
 - 3. Retain mock-up during construction as a standard for comparison with completed work.
 - 4. Do not alter or remove mock-up until work is completed or removal is authorized.

1.6 PRE-INSTALLATION CONFERENCE

- A. Convene a conference approximately two weeks before scheduled commencement of the Work. Attendees shall include Architect, Contractor and trades involved. Agenda shall include schedule, responsibilities, critical path items and approvals.
- 1.7 DELIVERY, STORAGE, AND HANDLING
 - A. Store and handle in strict compliance with manufacturer's written instructions and recommendations.
 - B. Protect from damage due to weather, excessive temperature, and construction operations.

1.8 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 recommended limits.

1.9 WARRANTY

A. Manufacturer's standard limited warranty unless indicated otherwise.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: MIFAB, Inc., which is located at: 1321 W. 119th St.; Chicago, IL 60643; ASD Toll Free Tel: 800-465-2736; Tel: 773.341.3030; Fax: 773-341-3047; Email: request info (sales@mifab.com); Web: http://www.mifab.com
- B. Substitutions: Not permitted.
- C. Requests for substitutions will be considered in accordance with provisions of Section.

2.2 FIRE RATED ACCESS DOORS

- A. Product: MFRU Series Uninsulated Fire Rated Access Door. Uninsulated fire rated access door. Approved by Underwriters Laboratories Inc., for 1-1/2 hours, "B" label in walls.
 - 1. Standards Compliance: ANSI-UL 10B.
 - 2. Listed: UL and ULc.
 - 3. Fire Rating: Underwriters Laboratories "B" label. 1-1/2 hours for walls. Insulation not required.
 - 4. Overall Dimensions: Door size dimensions plus 2-1/4 inch (mm).
 - 5. Wall Opening: Door size dimension plus 1/2 inch.
 - 6. Material: 16 gage; 0.0598 inches satin coat steel door and frame.
 - a. Finish: Satin coat steel doors have a primed white finish.
 - 7. Material: 16 gage; 0.0625 inches Stainless Steel No. 304 stainless steel door and frame.
 - a. Finish: Stainless steel doors have a No. 4 brush satin finish.
 - 8. Door: Flush to frame. Self-closing. Can be opened from the inside or back of the door with thumb turn latch.
 - 9. Frame: Four piece welded frame with masonry mounting straps.
 - 10. Hinge: Concealed pivot pins.
 - 11. Spring: Heavy duty.
 - 12. Latch: Cylinder key lock. All cylinder key locks are keyed alike.
 - 13. Door Size: 12 x 12 inches. Latches: 1.
 - a. Rough Opening: 12-1/2 x 12-1/2 inches.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly constructed and prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect in writing of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions, approved submittals, and in proper relationship with adjacent construction.

3.4 FIELD QUALITY CONTROL

- A. Field Inspection: Coordinate field inspection in accordance with appropriate sections in Division 01.
- B. Manufacturer's Services: Coordinate manufacturer's services in accordance with appropriate sections in Division 01.

3.5 CLEANING AND PROTECTION

- A. Clean products in accordance with the manufacturer's recommendations.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 083613 - RESIDENTIAL SECTIONAL DOORS

PART1- GENERAL

1.1 SECTION INCLUDES

- A. Residential sectional doors of the following types:
 - 1. Steel sectional doors. (Modern Steel Collection)

1.2 RELATED SECTIONS

- A. Section 055000 Metal Fabrications.
- B. Section 061000 Rough Carpentry.
- C. Division 16 Electrical Electrical service and connections for powered operators.

1.3 REFERENCES

- A. ASTM International (ASTM):
 - 1. ASTM A 653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - 2. ASTM A 924 Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.

1.4 SUBMITTALS

- A. Submit under provisions of Section 013000 Administrative Requirements.
- B. Product Data: Manufacturer's data sheets and detail drawings for each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation details and methods.
 - 4. Operation and maintenance data.
 - 5. Nameplate data and ratings for motors.
- C. Shop Drawings: Include opening dimensions and required tolerances, connection details, anchorage spacing, hardware locations, and installation details.
- D. Selection Samples: Submit two complete sets of color chips representing manufacturer's full range of available colors and patterns.

E. Verification Samples: For each finish product specified, submit samples that represent actual product, color, and sheen.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the types of doors specified in this section, with not less than ten years of documented experience.
- B. Installer Qualifications: Company specializing in installing the types of products specified in this section, with minimum of two years of documented experience, and approved by the door manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store and handle materials and products in strict compliance with manufacturer's instructions and recommendations and industry standards.
- B. Store products indoors in manufacturer's or fabricator's original containers and packaging, with labels clearly identifying product name and manufacturer. Protect from damage.

1.7 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install systems under environmental conditions outside manufacturer's recommended limits.

1.8 WARRANTY

- A. Finish Warranty:
 - 1. Warranty period: Lifetime against rust through. All Premium Residential Doors.
- B. Delamination Warranty: Provide manufacturer's standard warranty against delamination.
 - 1. Warranty period: 5 years.
- C. Hardware and Springs Warranty: Provide manufacturer's standard warranty against defects in materials or workmanship.
 - 1. Warranty period: 3 years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturer: Clopay Corporation
- 2.2 SECTIONAL OVERHEAD DOORS GENERAL
 - A. Wind Performance Requirements: As requested, design doors to withstand positive and negative wind loads as calculated in accordance with applicable building code. Doors tested to 1.5 times design wind load, according to ASTM E330.
 - 1. Design Wind Load: +38,-44 lb/sf
 - B. Counterbalance Type: Torsion spring counterbalance.
 - 1. Torsion spring counterbalance mechanism sized to weight of the door, with helically wound, coated oil tempered or galvanized torsion spring mounted on a steel shaft; cable drum of die cast aluminum with high strength galvanized aircraft cable with minimum 7 to 1 safety factor.
 - a. Spring Type: Standard Cycle Spring, 10,000 cycle.
- 2.3 RESIDENTIAL SECTIONAL DOORS Modern Steel Collection
 - A. Residential Steel Sectional Doors: Modern Steel Collection as manufactured by Clopay Corporation.
 - 1. Expanded Polystyrene (EPS) Insulated 2 inches thick product:
 - a. Grooved Model: Clopay Model 4305
 - 2. Door Construction:
 - a. Sections (EPS): Pressure bonded expanded polystyrene (EPS) core construction between exterior and interior steel skins.
 - b. Exterior Steel Skins: Formed from flush commercial or drawing quality steel sheet, hot-dip galvanized per ASTM A 924/A 924M and ASTM A 653/A 653M, pre-painted with primer and baked-on polyester topcoat.
 - c. Interior Steel Skins: Formed from roll formed commercial or drawing quality steel sheet, hot-dip galvanized per ASTM A 924/A 924M and ASTM A 653/A 653M, pre-painted with primer and baked-on polyester topcoat.
 - d. Section Joints: Sections formed to create tongue-in-groove meeting joint with thermal break.
 - e. Door Stiles: Galvanized steel end stiles and center stiles, pre-punched for easy hinge attachment.
 - f. Reinforcing: Galvanized and primed steel reinforcement located under each hinge location, pre-punched for hinge attachment.

- g. Connections: Stiles fastened to steel skins using Tog-L-Loc system.Handles: 2 High impact polymer step plate/lift handles to comply with DASMA 116 and be color-matched to the door sections.
- 3. Steel Skin Thickness:
 - a. Exterior: Minimum 27 gauge 0.016 inch
 - b. Interior: Minimum 27 gauge 0.015 inch EPS Doors
- 4. End Stiles: Galvanized steel end stiles, engineered for easy hardware attachment through pre-punched holes. Minimum 20 gauge, 0.034 inch thick
- 5. Bottom Section: Reinforced with continuous 0.040 inch aluminum astragal retainer with U-shaped flexible PVC astragal
- 6. Thermal Resistance: Calculated in accordance with DASMA TDS-163
 - a. EPS 2 inch Thick R-Value: 9.0 (deg F hr sq ft/Btu.)
- 7. Interior Finish: EPS Door- Stucco embossed texture with flush design, white interior color
- 8. Exterior Finishes:
 - a. Finish Type: Stucco embossed texture.
 - b. Color: Color Blast® (Sherwin Williams[®] Color Code High quality durable two-part Polane® paint system) SW #_____
- 9. Locking: Standard, keyed spring-loaded lock bar.
- 10. Perimeter Seals: Provide full perimeter stop molding
- 11. Tracks: Vertical tracks minimum 0.040 inch galvanized steel tapered and mounted for wedge type closing. Horizontal tracks minimum 0.051 inch galvanized steel, reinforced with minimum 0.0897 inch galvanized steel angles as required.
 - a. Track Type: Provide standard lift tracks
 - b. Track Width: 2 inches
 - c. Track Radius: 15 inch

2.4 BELT DRIVE GARAGE DOOR OPERATORS

- A. Belt Drive Garage Door Operator: LiftMaster WLED DC Battery Backup Belt Drive Wi-Fi Garage Door Operator.
 - 1. Motor:
 - a. 12V DC motor
 - b. Thermal Protection: Automatic
 - c. Lubrication: Permanent
 - 2. Drive Mechanism:
 - a. Drive Means: Full reinforced drive belt
 - b. Reduction Means: Gear 63:1
 - c. Door Linkage: Adjustable door arm

- 3. Logic Type:
 - a. Solid-state microcontroller with built-in surge suppressor
- 4. Adjustments:
 - a. Auto-Force
 - b. Electronic Limit Settings
- 5. Travel Rate:
 - a. 9 inches per second (up direction) and 6-1/2 inches per second (down direction)
- 6. Electrical:
 - a. Voltage: 120V AC, 60 Hz.
 - b. Current Rating: 2.7A
 - c. UL Listed
 - d. Length of 3-Prong Line Cord: 6 feet
- 7. Security+ 2.0 Radio Controls:
 - a. LiftMaster 893MAX 3-Button Remote Control
 - b. Coding System: Smart receiver code button and indicator light
 - c. Operating Range: 200 feet (approximately)
 - d. Operating Temperature: -40 degrees F to 150 degrees F
 - e. Remote Control Radio Frequency: 310, 315 and 390 MHz tri-band
 - f. Radio Receiver Frequency: Frequency agile on 310, 315 and 390 MH.
 - g. Security+ 2.0 anti-burglary coding
- 8. MyQ Powered Radio:
 - a. 50-channel FHSS (Frequency Hopping Spread Spectrum
 - b. Provides two-way communication from garage door operator and MyQ Accessories.
 - c. Enables remote closing of garage door with key MyQ Accessories
 - d. Enables monitoring and control of garage door operators and lighting controls via Wi-Fi-enabled smartphone, table or computer (sold separately)
- 9. Security+ 2.0 Encrypted Controls:
 - a. LiftMaster 880LMW Smart Control Panel
 - b. LCD Screen: Time, temperature, Wi-Fi setup and status display
 - c. Maintenance Alert System
 - d. Timer-to-Close
 - e. Light Controls: Turns operator lights on/off
 - f. Program remote controls, keypads, Wi-Fi garage door openers and MyQ Accessories
 - g. Lock Mode: Locks out outside remote controls
 - h. Motion Detecting: Hands-free operator lights on

- 10. Convenience/Safety Features:
 - a. The Protector System safety reversing sensors
 - b. Alert-2-Close unattended close operation with select accessories (must not be used with one-piece door)
 - c. Hands-free operator lights on
 - d. Emergency/quick release
 - e. Automatic trolley reconnect
 - f. Ventilation/pet opening
 - g. Down safety reverse
 - h. Up safety stop
 - i. Door open/beam obstructed/lights on
 - j. Maintenance Alert System
 - k. Integrated Battery Backup
 - I. PosiLock secure lock system
 - m. Slow start/soft sto
 - n. Automatic Garage Door Lock Capable: LiftMaster 841LM will automatically engage / disengage the lock as the opener is activated.
- 11. Warranty:
 - a. Lifetime motor and belt
 - b. 5-year parts
 - 1) 1-year battery (LiftMaster Model 485LM)

PART 3 - EXECUTION

3.1 EXAMINATION AND PREPARATION

- A. Inspect and prepare substrates and openings for compliance with anchorage requirements using the methods recommended by the manufacturer for achieving best result for the substrates and openings under project conditions. Examine wall and overhead areas, including opening framing and blocking, with installer present, for compliance with requirements for installation tolerances, clearances, and other conditions affecting performance of Work in this Section.
- B. Do not proceed with installation until substrates and opening have been prepared using the methods recommended by the manufacturer and deviations from manufacturer's recommended tolerances and conditions that will be detrimental to the installation are corrected. Commencement of installation constitutes acceptance of conditions.
- C. If preparation is the responsibility of another installer, notify Architect in writing of deviations from manufacturer's recommended installation tolerances and conditions.

3.2 INSTALLATION

A. Install products in accordance with approved shop drawings and the manufacturer's printed instructions. Install in proper relationship with adjacent construction. Test for proper operation and repeat until satisfactory results are obtained.

3.3 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 084213 - ALUMINUM-FRAMED ENTRANCES

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 manual-swing entrance doors and door-frame units.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For aluminum-framed entrances. Include plans, elevations, sections, full-size details, and attachments to other work.
 - 1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
 - 2. Include full-size isometric details of each vertical-to-horizontal intersection of aluminum-framed entrances, showing the following:
 - a. Joinery, including concealed welds.
 - b. Anchorage.
 - c. Expansion provisions.
 - d. Glazing.
 - e. Flashing and drainage.
 - 3. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.
- C. Samples for Initial Selection: For units with factory-applied color finishes.
- D. Entrance Door Hardware Schedule: Prepared by or under supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.

1.4 SOURCE LIMITATIONS: Obtain aluminum-framed storefront system, components, and accessories through one source from a single manufacturer.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
- B. Structural: Test according to ASTM E 330 as follows:
 - 1. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
 - 2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including 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.
- C. Air Infiltration: Test according to ASTM E 283 for infiltration as follows:
 - 1. Entrance Doors:
 - a. Pair of Doors: Maximum air leakage of 1.0 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft..
- D. Water Penetration under Static Pressure: Test according to ASTM E 331 as follows:
 - 1. No evidence of water penetration through fixed glazing and framing areas when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 10 lbf/sq. ft..
- E. Noise Reduction: Test according to ASTM E 90, with ratings determined by ASTM E 1332, as follows.
 - 1. Outdoor-Indoor Transmission Class: Minimum 30.
- F. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes:
 - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by the one of the following:
 - 1. Kawneer, North America
 - 2. Tubelite Inc.
 - 3. YKK AP America Inc.

2.3 ENTRANCE DOOR SYSTEMS

- A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.
 - 1. Door Construction: 2-inch overall thickness, with minimum 0.188-inch- thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.
 - 2. Door Design: As indicated on A0.960, A1.600, A2.600, A3.600, A4.600, A7.100
 - 3. Glazing Stops and Gaskets: Beveled , snap-on, extruded-aluminum stops and preformed gaskets.
- B. Framing Members: Manufacturer's standard extruded aluminum, minimum 0.125 inch thick and reinforced as required to support imposed loads.
 - 1. Nominal Size: As indicated on Drawings.
- 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.

2.4 ENTRANCE DOOR HARDWARE

A. General: Provide entrance door hardware and entrance door hardware sets indicated in door and frame schedule for each entrance door to comply with requirements in this Section.

ALUMINUM-FRAMED ENTRANCES

- 1. Entrance Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and named manufacturers' products.
- 2. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.
- 3. Opening-Force Requirements:
 - a. Egress Doors: Not more than 15 lbf to release the latch and not more than 30 lbfto set the door in motion and not more than 15 lbf to open the door to its minimum required width.
- B. Manual Flush Bolts: BHMA A156.16, Grade 1.
- C. 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.
- D. Operating Trim: BHMA A156.6.
- E. 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.
- F. Thresholds: BHMA A156.21, raised thresholds beveled with a slope of not more than 1:2, with maximum height of 1/2 inch.

2.5 GLAZING

- A. Glazing: Comply with Section 088000 "Glazing."
- B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.
- C. Glazing Sealants: As recommended by manufacturer.

2.6 ACCESSORIES

A. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.

2.7 FABRICATION

- A. Form or extrude aluminum shapes before finishing.
- B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- C. Fabricate components that, when assembled, have the following characteristics:

- 1. Profiles that are sharp, straight, and free of defects or deformations.
- 2. Accurately fitted joints with ends coped or mitered.
- 3. Physical and thermal isolation of glazing from framing members.
- 4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
- 5. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
- D. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
 - 1. At exterior doors, provide compression weather stripping at fixed stops.
- E. 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.
- F. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.8 ALUMINUM FINISHES

- A. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.
 - 1. Color: As selected by Architect from full range of industry colors and color densities.

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 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.

ALUMINUM-FRAMED ENTRANCES

- 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 installing nonconductive spacers.
 - 2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- C. Set continuous sill members and flashing in full sealant bed as specified in Section 079200 "Joint Sealants" to produce weathertight installation.
- D. Install components plumb and true in alignment with established lines and grades.
- E. 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.

END OF SECTION 084213

SECTION 084313 - ALUMINUM-FRAMED 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: Aluminum Storefront Systems, including perimeter trims, stools, accessories, shims and anchors, and perimeter sealing of storefront units.
 - 1. Types of Aluminum Storefront Systems include:
 - a. Framing System 2" x 4-1/2" (50.8 mm x 114.3 mm) nominal dimension; Thermal Glazing - Front, Screw Spline Fabrication.
 - B. Related Sections:
 - 1. 083213 "Sliding Aluminum-Framed Glass Doors"
 - 2. 084113 "Aluminum Framed Entrances and Storefronts"
 - 3. 085113 "Aluminum Windows"
 - 4. 088000 "Glazing"

1.3 Definitions

- A. Definitions: For fenestration industry standard terminology and definitions refer to American Architectural Manufacturers Association (AAMA) Ó AAMA Glossary (AAMA AG).
- 1.4 Performance Requirements
 - A. Storefront System Performance Requirements:
 - Wind loads: Provide storefront system; include anchorage, capable of withstanding wind load design pressures of 26.0 lbs./sq. ft. inward and 28.1 lbs./sq. ft. outward. The design pressures are based on the 2015 International Building Code.
 - 2. Air Leakage: The test specimen shall be tested in accordance with ASTM E 283. Air Leakage rate shall not exceed 0.06 cfm/ft2 (0.3 l/s · m2) at a static air pressure differential of 6.2 psf (300 Pa) with interior seal, or, rate shall not exceed 0.06 cfm/ft2 (0.3 l/s · m2) at a static air pressure differential of 1.6 psf (75 Pa) without interior seal. CSA A440 Fixed Rating.

- 3. Water Resistance: The test specimen shall be tested in accordance with ASTM E 331. There shall be no leakage at a minimum static air pressure differential of 8 psf (383 Pa) as defined in AAMA 501.
- 4. Uniform Load: A static air design load of 35 psf (1680 Pa) shall be applied in the positive and negative direction in accordance with ASTM E 330. There shall be no deflection in excess of L/175 of the span of any framing member. At a structural test load equal to 1.5 times the specified design load, no glass breakage or permanent set in the framing members in excess of 0.2% of their clear spans shall occur.
- 5. Seismic: When tested to AAMA 501.4, system must meet design displacement of 0.010 x the story height and ultimate displacement of 1.5 x the design displacement.
- 6. Thermal Movements: Allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures:
 - a. Temperature Change (Range): 0 deg F (-18 deg C); 180 deg F (82 deg C).
 - b. Test Interior Ambient-Air Temperature: [75 deg F (24 deg C)].
- 7. Test Performance: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5 for a minimum 3 cyclesEnergy Efficiency:
 - a. Thermal Transmittance (U-factor): When tested to AAMA Specification 1503, the thermal transmittance (U-factor) shall not be more than:
 - 1) Glass to Exterior Ó 0.47 (low-e) or 0.61 (clear)
- 8. Condensation Resistance (CRF): When tested to AAMA Specification 1503, the condensation resistance factor shall not be less than:
 - a. Glass to Exterior Ó 70_{frame} and 69_{glass} (low-e) or 69_{frame} and 58_{glass} (clear).
- 9. Sound Transmission Class (STC) and Outdoor-Indoor Transmission Class (OITC): When tested to AAMA Specification 1801 and in accordance with ASTM E1425 and ASTM E90, the STC and OITC Rating shall not be less than:
 - a. Glass to Exterior Ó 38 (STC) and 31 (OITC).

1.5 Submittals

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, hardware, finishes, and installation instructions for each type of aluminum-framed storefront system indicated.
- B. Shop Drawings: Include plans, elevations, sections, details, hardware, and attachments to other work, operational clearances and installation details.
- C. Samples for Initial Selection: For units with factory-applied color finishes including samples of hardware and accessories involving color selection.
- D. Samples for Verification: For aluminum-framed storefront system and components required.

- E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency for each type of aluminum-framed storefront.
- F. Fabrication Sample: Of each vertical-to-horizontal intersection of aluminum-framed systems, made from 12" lengths of full-size components and showing details of the following:
 - 1. Joinery.
 - 2. Anchorage.
 - 3. Expansion provisions.
 - 4. Glazing.
 - 5. Flashing and drainage.
- G. Other Action Submittals:
 - 1. Entrance Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.
- 1.6 Quality Assurance
 - A. Installer Qualifications: An installer which has had successful experience with installation of the same or similar units required for the project and other projects of similar size and scope.
 - B. Manufacturer Qualifications: A manufacturer capable of providing aluminum-framed storefront system that meet or exceed performance requirements indicated and of documenting this performance by inclusion of test reports, and calculations.
 - C. Source Limitations: Obtain aluminum-framed storefront system through one source from a single manufacturer.
 - D. Product Options: Drawings indicate size, profiles, and dimensional requirements of aluminum-framed storefront system and are based on the specific system indicated. Refer to Division 01 Section ÓProduct Requirements: Do not modify size and dimensional 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.
 - E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Build mockup for type(s) of storefront elevation(s) indicated:
 - a. Level 1 Commercial Storefront
 - b. Level 5 Storefront Window

ALUMINUM-FRAMED STOREFRONTS

- 2. Mockups may be incorporated into finished work.
- F. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section ÓProject Management and Coordination.
- G. Structural-Sealant Joints: Design reviewed and approved by structural-sealant manufacturer.
- 1.7 Project Conditions
 - A. Field Measurements: Verify actual dimensions of aluminum-framed storefront openings by field measurements before fabrication and indicate field measurements on Shop Drawings.
- 1.8 Warranty
 - A. Manufacturer¢s Warranty: Submit, for Owner¢s acceptance, manufacturer¢s standard warranty.
 - 1. Warranty Period: Two (2) years from Date of Substantial Completion of the project provided however that the Limited Warranty shall begin in no event later than six months from date of shipment by manufacturer.

PART 2 - PRODUCTS

- 2.1 Manufacturers
 - A. Basis-of-Design Product:
 - 1. Kawneer Company Inc.
 - 2. Trifab™ 451T (Thermal) Framing System
 - 3. System Dimensions: 2" x 4-1/2" (50.8 mm x 114.3 mm)
 - 4. Glass: Exterior
 - B. Subject to compliance with requirements, provide a comparable product by the following:
 - 1. Tubelite Inc.
 - 2. YKK AP America Inc.
 - C. Substitutions: Refer to Substitutions Section for procedures and submission requirements
 - 1. Pre-Contract (Bidding Period) Substitutions: Submit written requests ten (10) days prior to bid date.
 - 2. Post-Contract (Construction Period) Substitutions: Submit written request in order to avoid storefront installation and construction delays.

ALUMINUM-FRAMED STOREFRONTS

- 3. Product Literature and Drawings: Submit product literature and drawings modified to suit specific project requirements and job conditions.
- 4. Certificates: Submit certificate(s) certifying substitute manufacturer (1) attesting to adherence to specification requirements for storefront system performance criteria, and (2) has been engaged in the design, manufacturer and fabrication of aluminum storefronts for a period of not less than ten (10) years. (Company Name)
- 5. Test Reports: Submit test reports verifying compliance with each test requirement required by the project.
- 6. Samples: Provide samples of typical product sections and finish samples in manufacturer's standard sizes.
- D. Substitution Acceptance: Acceptance will be in written form, either as an addendum or modification, and documented by a formal change order signed by the Owner and Contractor.
- 2.2 Materials
 - A. Aluminum Extrusions: Alloy and temper recommended by aluminum storefront manufacturer for strength, corrosion resistance, and application of required finish and not less than 0.070" (1.8 mm) wall thickness at any location for the main frame and complying with ASTM B 221: 6063-T6 alloy and temper.
 - B. Fasteners: Aluminum, nonmagnetic stainless steel or other materials to be non-corrosive and compatible with aluminum framing members, trim hardware, anchors, and other components.
 - C. Anchors, Clips, and Accessories: Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions or other suitable zinc coating; provide sufficient strength to withstand design pressure indicated.
 - D. Reinforcing Members: Aluminum, nonmagnetic stainless steel, or nickel/chrome-plated steel complying with ASTM B 456 for Type SC 3 severe service conditions, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions or other suitable zinc coating; provide sufficient strength to withstand design pressure indicated.
 - E. Sealant: For sealants required within fabricated storefront system, provide permanently elastic, non-shrinking, and non-migrating type recommended by sealant manufacturer for joint size and movement.
 - F. Tolerances: Reference to tolerances for wall thickness and other cross-sectional dimensions of storefront members are nominal and in compliance with AA Aluminum Standards and Data.
- 2.3 Storefront Framing System
 - A. Thermal Barrier

- 1. Basis of Design: Kawneer IsoLock Thermal Break with a 1/4" (6.4 mm) separation consisting of a two-part chemically curing, high-density polyurethane, which is mechanically and adhesively joined to aluminum storefront sections.
 - a. Thermal Break shall be designed in accordance with AAMA TIR-A8 and tested in accordance with AAMA 505.
- B. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.
- C. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials. Where exposes shall be stainless steel.
- D. Perimeter Anchors: When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action
- E. Packing, Shipping, Handling and Unloading: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- F. Storage and Protection: Store materials protected from exposure to harmful weather conditions. Handle storefront material and components to avoid damage. Protect storefront material against damage from elements, construction activities, and other hazards before, during and after storefront installation.
- 2.4 Glazing Systems
 - A. Glazing: As specified in Division 08 Section "Glazing:"
 - B. Glazing Gaskets: Manufacturer's standard compression types; replaceable, extruded EPDM rubber.
 - C. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.
 - D. Bond-Breaker Tape: Manufacturer's standard TFE-fluorocarbon or polyethylene material to which sealants will not develop adhesion.
 - E. Glazing Sealants: For structural-sealant-glazed systems, as recommended by manufacturer for joint type, and as follows:
 - 1. Structural Sealant: ASTM C 1184, single-component neutral-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 a structural-sealant manufacturer for use in aluminum-framed systems indicated.
 - a. Color: Black
- 2. Weatherseal Sealant: ASTM C 920 for Type S, Grade NS, Class 25, Uses NT, G, A, and O; single-component neutral-curing formulation that is compatible with structural sealant and other system components with which it comes in contact; recommended by structural-sealant, weatherseal-sealant, and aluminum-framed-system manufacturers for this use.
 - a. Color: Matching structural sealant.
- 2.5 Entrance Door Systems
 - A. Entrance Doors: As specified in Division 084213 Section "Aluminum-Framed Entrances."
 - B. Entrance Door Hardware: As specified in Division 084113 Section "Door Hardware."
- 2.6 Accessory Materials
 - A. Fixed Louver Infill Panel: As specified in Division 089119 Section "Fixed Louvers"
 - B. Joint Sealants: For installation at perimeter of aluminum-framed systems, as specified in Division 07 Section "Joint Sealants".
 - C. Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos; formulated for 30 mil thickness per coat.
- 2.7 Fabrication
 - A. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:
 - 1. Profiles that are sharp, straight, and free of defects or deformations.
 - 2. Accurately fit joints; make joints flush, hairline and weatherproof.
 - 3. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.
 - 4. Physical and thermal isolation of glazing from framing members.
 - 5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
 - 6. Provisions for field replacement of glazing.
 - 7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
 - B. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.
 - C. Structural-Sealant-Glazed Framing Members: Include accommodations for using temporary support device to retain glazing in place while structural sealant cures.

MasterSpec

- D. Storefront Framing: Fabricate components for assembly using manufacturer's standard installation instructions.
- E. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.
- 2.8 Aluminum Finishes
 - A. Factory Finishing:
 - 1. Architectural Class I Color Anodic Coating: Color as selected from manufacturer's full range.
- 2.9 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 work. Verify rough opening dimensions, levelness of sill plate and operational clearances. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure a coordinated, weather tight framed aluminum storefront system installation.
 - 1. Masonry Surfaces: Visibly dry and free of excess mortar, sand, and other construction debris.
 - 2. Wood Frame Walls: Dry, clean, sound, well nailed, free of voids, and without offsets at joints. Ensure that nail heads are driven flush with surfaces in opening and within 3 inches of opening.
 - 3. Metal Surfaces: Dry; clean; free of grease, oil, dirt, rust, corrosion, and welding slag; without sharp edges or offsets at joints.
 - 4. Proceed with installation only after unsatisfactory conditions have been corrected.

2.10 Installation

- A. Comply with Drawings, Shop Drawings, and manufacturer's written instructions for installing aluminum-framed storefront system, accessories, and other components.
- B. Install aluminum-framed storefront system level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction.
- C. Set sill members in bed of sealant or with gaskets, as indicated, for weather tight construction.
- D. Install aluminum-framed storefront system and components to drain condensation, water penetrating joints, and moisture migrating within aluminum-framed storefront to the exterior.

E. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

2.11 Field Quality Control

- A. Field Tests: Architect shall select storefront units to be tested as soon as a representative portion of the project has been installed, glazed, perimeter caulked and cured. Conduct tests for air infiltration and water penetration with manufacturer's representative present. Tests not meeting specified performance requirements and units having deficiencies shall be corrected as part of the contract amount.
 - Testing: Testing shall be performed by a qualified independent testing agency. Refer to Testing Section for payment of testing and testing requirements. Testing Standard per AAMA 503, including reference to ASTM E 783 for Air Infiltration Test and ASTM E 1105 Water Infiltration Test.
 - a. Air Infiltration Tests: Conduct tests in accordance with ASTM E 783. Allowable air infiltration shall not exceed 1.5 times the amount indicated in the performance requirements or 0.09 cfm/ft², whichever is greater.
 - Water Infiltration Tests: Conduct tests in accordance with ASTM E 1105. No uncontrolled water leakage is permitted when tested at a static test pressure of two-thirds the specified water penetration pressure but not less than 6.2 psf (300 Pa).
- B. Manufacturer's Field Services: Upon Owner¢s written request, provide periodic site visit by manufacturer¢s field service representative.
- 2.12 Adjusting, Cleaning, and Protection
 - A. Clean aluminum surfaces immediately after installing aluminum-framed storefronts. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.
 - B. Clean glass immediately after installation. Comply with glass manufacturer's written recommendations for final cleaning and maintenance. Remove nonpermanent labels, and clean surfaces.
 - C. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

END OF SECTION 084113

SECTION 085313 - 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 vinyl-framed windows.

1.3 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, discuss, and coordinate the interrelationship of vinyl windows with other exterior wall components. Include provisions for anchoring, flashing, weeping, sealing perimeters, and protecting finishes.
 - 3. Review and discuss the sequence of work required to construct a watertight and weathertight exterior building envelope.
 - 4. Inspect and discuss the condition of substrate and other preparatory work performed by other trades.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, glazing and fabrication methods, dimensions of individual components and profiles, hardware, and finishes for 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 Initial Selection: For units with factory-applied finishes.

VINYL WINDOWS

- 1. Include Samples of hardware and accessories involving color selection.
- E. 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.
- F. Product Schedule: For vinyl windows. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer and Installer.
- B. Product Test Reports: For each type of vinyl window, for tests performed by a qualified testing agency.
- C. Field quality-control reports.
- D. Sample Warranties: For manufacturer's warranties.

1.6 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.
- C. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 - 1. Build mockup of typical wall area 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.

1.7 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace vinyl windows that fail in materials or workmanship within specified warranty period.

VINYL WINDOWS

- 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: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

- 2.1 MANUFACTURERS
 - A. Source Limitations: Obtain vinyl windows from single source from single manufacturer.

2.2 WINDOW 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: LC.
 - 2. Minimum Performance Grade: 50.
- C. Thermal Transmittance: NFRC 100 maximum whole-window U-factor of 0.32 Btu/sq. ft. x h x deg F .
- D. Solar Heat-Gain Coefficient (SHGC): NFRC 200 maximum whole-window SHGC of 0.27.
- E. Sound Transmission Class (STC): Rated for not less than 26 STC when tested for laboratory sound transmission loss according to ASTM E 90 and determined by ASTM E 413.
- F. Outside-Inside Transmission Class (OITC): Rated for not less than 22 OITC when tested for laboratory sound transmission loss according to ASTM E 90 and determined by ASTM E 1332.

G. Windborne-Debris-Impact Resistance: Capable of resisting impact from windborne debris based on testing glazed windows identical to those specified, according to ASTM E 1886 and testing information in ASTM E 1996 and requirements of authorities having jurisdiction.

2.3 VINYL WINDOWS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Graham Architectural Products Corporation.
 - 2. PGT Industries.
 - 3. Weather Shield Mfg., Inc.
 - 4. Ply Gem
- B. Operating Types: Provide the following operating types in locations indicated on Drawings:
 - 1. Casement: Project out.
 - 2. Fixed.
- C. Frames and Sashes: Impact-resistant, UV-stabilized PVC complying with AAMA/WDMA/CSA 101/I.S.2/A440.
 - 1. Finish: Integral color, Insert finish.
 - 2. Gypsum Board Returns: Provide at interior face of frame.
- D. Glass: Clear annealed glass, ASTM C 1036, Type 1, Class 1, q3.
 - 1. Kind: Fully tempered where indicated on Drawings.
- E. Hardware, General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, carbon steel complying with AAMA 907, or other corrosion-resistant material compatible with adjacent materials; designed to smoothly operate, tightly close, and securely lock windows, and sized to accommodate sash weight and dimensions.
 - 1. Exposed Hardware Color and Finish: As selected by Architect from manufacturer's full range.
- F. Weather Stripping: Provide full-perimeter weather stripping for each operable sash unless otherwise indicated.
- G. Fasteners: Noncorrosive and 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.

2.4 INSECT SCREENS

- A. General: Fabricate insect screens to integrate with window frame. Provide screen for each operable exterior sash. Screen wickets are not permitted.
- B. Aluminum Frames: Manufacturer's standard aluminum alloy complying with SMA 1004 or SMA 1201. Fabricate frames with mitered or coped joints or corner extrusions, concealed fasteners, and removable PVC spline/anchor concealing edge of frame.

2.5 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. Bay Window Assemblies: Provide operating units in configuration indicated. Provide window frames, sashes, hardware, and other trim and components necessary for a complete, secure, and weathertight installation, including the following:
 - 1. Angled mullion posts with interior and exterior trim.
 - 2. Angled interior and exterior extension and trim.
 - 3. Clear pine head and seat boards.
 - 4. Top and bottom plywood platforms.
 - 5. Exterior head and sill casings and trim.
 - 6. Support brackets.
- G. 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 E 2112.
- 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 Agency: Owner will engage a qualified testing agency to perform tests and inspections.
 - 1. Testing and inspecting agency will interpret tests and state in each report whether tested work complies with or deviates from requirements.
- B. 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 AAMA 502.
 - 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] <Insert number> 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:

VINYL WINDOWS

- 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.
- 5. Test Reports: Prepared according to AAMA 502.
- C. Windows will be considered defective if they do not pass tests and inspections.
- D. 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 085313

SECTION 088000 - GLAZING

1.1 QUALITY ASSURANCE

A. Install glazing in mockups specified in other Division 08 Sections.

1.2 PERFORMANCE REQUIREMENTS

- A. Engineering design of glass by Contractor.
- B. Windborne-Debris-Impact Resistance of Exterior Glazing: Wind Zone [1] [2] [3] [4].

1.3 MONOLITHIC GLASS SCHEDULE

- A. Clear [annealed] [heat-strengthened] [fully tempered] float glass.
- B. Ultraclear [annealed] [heat-strengthened] [fully tempered] float glass.
- C. Pyrolytic-coated, self-cleaning, low-maintenance, clear [annealed] [heat-strengthened] [fully tempered] float glass.
- D. Tinted [annealed] [heat-strengthened] [fully tempered] float glass.

END OF SECTION 088000

MasterSpec

SECTION 088300 - MIRRORS

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 the following types of silvered flat glass mirrors:
 - 1. Film-backed Laminated Tempered glass mirrors qualifying as safety glazing.
- B. Related Requirements:
 - 1. Section 088000 "Glazing" for glass with reflective coatings used for vision and spandrel lites.
 - 2. Section 102800 "Toilet, Bath, and Laundry Accessories" for metal-framed mirrors.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Mirrors. Include description of materials and process used to produce each type of silvered flat glass mirror specified that indicates sources of glass, glass coating components, edge sealer, and quality-control provisions.
- B. Shop Drawings: Include mirror elevations, edge details, mirror hardware, and attachment details.
- C. Samples: For each type of the following:
 - 1. Mirrors: 12 inches square, including edge treatment on two adjoining edges.
 - 2. Mirror Clips: Full size.
 - 3. Mirror Trim: 12 inches long.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: For each type of mirror and mirror mastic.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For mirrors to include in maintenance manuals.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect mirrors according to mirror manufacturer's written instructions and as needed to prevent damage to mirrors from moisture, condensation, temperature changes, direct exposure to sun, or other causes.
- B. Comply with mirror manufacturer's written instructions for shipping, storing, and handling mirrors as needed to prevent deterioration of silvering, damage to edges, and abrasion of glass surfaces and applied coatings. Store indoors.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not install mirrors until ambient temperature and humidity conditions are maintained at levels indicated for final occupancy.

1.8 WARRANTY

- A. Special Warranty: Manufacturer agrees to replace mirrors that deteriorate within specified warranty period. Deterioration of mirrors is defined as defects developed from normal use that are not attributed to mirror breakage or to maintaining and cleaning mirrors contrary to manufacturer's written instructions. Defects include discoloration, black spots, and clouding of the silver film.
 - 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Avalon Glass and Mirror Company.
 - 2. Binswanger Glass.
 - 3. Donisi Mirror Company.
 - 4. D & W Incorporated.
 - 5. Gardner Glass Products, Inc.
 - 6. Glasswerks LA, Inc.
 - 7. Guardian Industries Corp.
 - 8. Independent Mirror Industries, Inc.
 - 9. Lenoir Mirror Company.

MIRRORS

- 10. National Glass Industries.
- 11. Trulite Glass & Aluminum Solutions.
- 12. Virginia Mirror Company, Inc.
- 13. Walker Glass Co., Ltd.
- B. Source Limitations for Mirrors: Obtain mirrors from single source from single manufacturer.
- C. Source Limitations for Mirror Accessories: Obtain mirror glazing accessories from single source.
- 2.2 SILVERED FLAT GLASS MIRRORS
 - A. Mirrors, General: ASTM C 1503; manufactured using copper-free, low-lead mirror coating process.
 - B. Tempered Glass Mirrors: Mirror Glazing Quality for blemish requirements and complying with ASTM C 1048 for Kind FT, Condition A, tempered float glass before silver coating is applied; clear tinted.
 - 1. Nominal Thickness: 6.0 mm.

2.3 MISCELLANEOUS MATERIALS

- A. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- B. Edge Sealer: Coating compatible with glass coating and approved by mirror manufacturer for use in protecting against silver deterioration at mirrored glass edges.
- C. Mirror Mastic: An adhesive setting compound, asbestos-free, produced specifically for setting mirrors and certified by both mirror and mastic manufacturer as compatible with glass coating and substrates on which mirrors will be installed.
 - 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. Franklin International.
 - b. Laurence, C. R. Co., Inc.
 - c. Liquid Nails Adhesive.
 - d. Palmer Products Corporation.
 - e. Royal Adhesives & Sealants, LLC.

2.4 MIRROR HARDWARE

A. Anchors and Inserts: Provide Concealed Fasteners and devices as required for mirror hardware installation. Provide toothed or lead-shield, expansion-bolt devices for drilled-in-place anchors. Provide galvanized anchors and inserts for applications on inside face of exterior walls and where indicated.

2.5 FABRICATION

- A. Fabricate mirrors in the shop to greatest extent possible.
- B. Fabricate cutouts for notches and holes in mirrors without marring visible surfaces. Locate and size cutouts so they fit closely around penetrations in mirrors.
- C. Mirror Edge Treatment: Flat polished.
 - 1. Seal edges of mirrors with edge sealer after edge treatment to prevent chemical or atmospheric penetration of glass coating.
 - 2. Require mirror manufacturer to perform edge treatment and sealing in factory immediately after cutting to final sizes.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, over which mirrors are to be mounted, with Installer present, for compliance with installation tolerances, substrate preparation, and other conditions affecting performance of the Work.
- B. Verify compatibility with and suitability of substrates, including compatibility of existing finishes or primers with mirror mastic.
- C. Proceed with installation only after unsatisfactory conditions have been corrected and surfaces are dry.

3.2 PREPARATION

A. Comply with mastic manufacturer's written installation instructions for preparation of substrates, including coating substrates with mastic manufacturer's special bond coating where applicable.

3.3 INSTALLATION

A. General: Install mirrors to comply with mirror manufacturer's written instructions and with referenced GANA publications. Mount mirrors accurately in place in a manner that avoids distorting reflected images.

MIRRORS

MasterSpec

- 1. GANA Publications: "Laminated Glazing Reference Manual," "Glazing Manual" and "Mirrors, Handle with Extreme Care: Tips for the Professional on the Care and Handling of Mirrors."
- B. Provide a minimum airspace of 1/8 inch between back of mirrors and mounting surface for air circulation between back of mirrors and face of mounting surface.
- C. Install mirrors with mastic and mirror hardware. Attach mirror hardware securely to mounting surfaces with mechanical fasteners installed with anchors or inserts as applicable. Install fasteners so heads do not impose point loads on backs of mirrors.
 - 1. Aluminum J-Channels: Provide setting blocks 1/8 inch thick by 4 inches long at quarter points. To prevent trapping water, provide, between setting blocks, two slotted weeps not less than 1/4 inch wide by 3/8 inch long at bottom channel.
 - 2. Install mastic as follows:
 - a. Apply barrier coat to mirror backing where approved in writing by manufacturers of mirrors and backing material.
 - b. Apply mastic to comply with mastic manufacturer's written instructions for coverage and to allow air circulation between back of mirrors and face of mounting surface.
 - c. After mastic is applied, align mirrors and press into place while maintaining a minimum airspace of 1/8 inch between back of mirrors and mounting surface.

3.4 CLEANING AND PROTECTION

- A. Protect mirrors from breakage and contaminating substances resulting from construction operations.
- B. Do not permit edges of mirrors to be exposed to standing water.
- C. Maintain environmental conditions that prevent mirrors from being exposed to moisture from condensation or other sources for continuous periods of time.
- D. Clean exposed surface of mirrors not more than four days before date scheduled for inspections that establish date of Substantial Completion. Clean mirrors as recommended in writing by mirror manufacturer.

END OF SECTION 088300

SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

- 1. Interior gypsum board.
- 2. Exterior gypsum board for ceilings and soffits.
- 3. Tile backing panels.
- B. Related Requirements:
 - 1. Section 061600 "Sheathing" for gypsum sheathing for exterior walls.
 - 2. Section 092116.23 "Gypsum Board Shaft Wall Assemblies" for metal shaft-wall framing, gypsum shaft liners, and other components of shaft-wall assemblies.
 - 3. Section 093013 "Ceramic Tiling" for cementitious backer units installed as substrates for ceramic tile.

1.3 ACTION 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.
- C. Samples for Verification: 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.
- C. Ceiling and wall materials 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 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. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:to, the following
 - a. American Gypsum.
 - b. Georgia-Pacific Building Products.
 - c. National Gypsum Company.
 - 2. Thickness: 5/8 inch, unless otherwise noted.
 - 3. Long Edges: Tapered.
- B. Gypsum Board, Type X: ASTM C 1396/C 1396M.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:to, the following
 - a. American Gypsum.
 - b. Georgia-Pacific Building Products.
 - c. National Gypsum Company.
 - 2. Thickness: 5/8 inch, unless otherwise noted.
 - 3. Long Edges: Tapered.
- C. Gypsum Ceiling Board: ASTM C 1396/C 1396M.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. American Gypsum.
 - b. Georgia-Pacific Building Products.
 - c. National Gypsum Company.
 - 2. Thickness: 5/8 inch, unless otherwise noted.
 - 3. Long Edges: Tapered.
- D. Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces.

- 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. American Gypsum.
 - b. Georgia-Pacific Building Products.
 - c. National Gypsum Company.
- 2. Core: As indicated 1/2 inch, unless otherwise noted.
- 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. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. American Gypsum.
 - b. Georgia-Pacific Building Products.
 - c. National Gypsum Company.
 - 2. Core: As indicated 1/2 inch, unless otherwise noted.

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. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. CertainTeed Corporation.
 - b. James Hardie Building Products, Inc.
 - c. National Gypsum Company.
 - d. United States Gypsum Company.
 - 2. Thickness: 5/8 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.

GYPSUM BOARD

- 1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized-steel sheet Galvanized or aluminum-coated steel sheet or rolled zinc Plastic Paper-faced galvanized-steel sheet.
- 2. Shapes:
 - a. Cornerbead.
 - b. Bullnose bead.
 - c. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - d. L-Bead: L-shaped; exposed long flange receives joint compound.
 - e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
 - f. Expansion (control) joint.
 - g. Curved-Edge Cornerbead: With notched or flexible flanges.
- B. Exterior Trim: ASTM C 1047.
 - 1. Material: Hot-dip galvanized-steel sheet, plastic, or rolled zinc.
 - 2. Shapes:
 - a. Cornerbead.
 - b. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - c. Expansion (Control) Joint: One-piece, rolled zinc with V-shaped slot and removable strip covering slot opening.

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. 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 setting-type, sandable topping compound.
 - 4. Finish Coat: For third coat, 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.

GYPSUM BOARD

- E. Joint Compound for Tile Backing Panels:
 - 1. 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. Steel Drill Screws: ASTM C 1002 unless otherwise indicated.
 - 2. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
 - 3. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

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. Wood Framing: Install gypsum panels over wood framing, with floating internal corner construction. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members or provide control joints to counteract wood shrinkage.
- J. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written instructions for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

3.3 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
 - 1. Wallboard Type: As indicated on Drawings.
 - 2. Type X: As indicated on Drawings.
 - 3. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
 - 4. On partitions/walls, apply gypsum panels vertically (parallel to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.

MasterSpec

- 5. On Z-shaped furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
- 6. Fastening Methods: Apply gypsum panels to supports with steel drill screws.
- B. 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 and face layers separately to supports with screws.
- C. 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 locations 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.

GYPSUM BOARD

- 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.
- D. Exterior Trim: Install in the following locations:
 - 1. LC-Bead: Use at exposed panel edges.
- E. 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 tile.
 - 3. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.
 - a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."
 - E. 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.

GYPSUM BOARD

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

END OF SECTION 092900

SECTION 093013 - CERAMIC TILING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Ceramic mosaic tile.
 - 2. Porcelain tile.
 - 3. Stone thresholds.
 - 4. Tile backing panels.
 - 5. Waterproof membrane for thinset applications.
 - 6. Crack isolation membrane.
 - 7. Metal edge strips.
- B. Related Requirements:
 - 1. Section 079200 "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.

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.
- 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 .

CERAMIC TILING

1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show locations of each type of tile and tile pattern.
- C. Samples for Initial Selection: For tile, grout, and accessories involving color selection.
- D. 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 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of product.
- B. Product Test Reports: For tile-setting and -grouting products and certified porcelain tile.

1.7 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.

1.8 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

CERAMIC TILING

- 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.

1.9 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.

1.10 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 MANUFACTURERS

- A. Source Limitations for Tile: Obtain tile of each type and color or finish from single source or producer.
 - 1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.
- B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from single manufacturer and each aggregate from single source or producer.
 - 1. Obtain setting and grouting materials, except for unmodified Portland cement and aggregate, from single manufacturer.
 - 2. Obtain waterproof membrane and crack isolation membrane, except for sheet products, from manufacturer of setting and grouting materials.
- C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer:

- 1. Waterproof membrane.
- 2. Crack isolation membrane.
- 3. Cementitious backer units.
- 4. Metal edge strips.

2.2 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.
 - 1. Where tile is indicated for installation in swimming pools on exteriors orin wet areas, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for installation indicated and has a record of successful in-service performance.

2.3 TILE PRODUCTS

- A. Porcelain Floor Tile
 - 1. Certification: Porcelain tile certified by the Porcelain Tile Certification Agency.
 - 2. Tile Color, Size, Glaze, and Pattern: See Finish Key.
 - 3. Grout Color: As selected by Architect from manufacturer's full range.
- B. Porcelain Wall Tile
 - 1. Certification: Tile certified by the Porcelain Tile Certification Agency.
 - 2. Tile Color, Size, Glaze, and Pattern: See Finish Key.
 - 3. Grout Color: As selected by Architect from manufacturer's full range.
- C. |Porcelain mosaic wall tile.
 - 1. Certification: Tile certified by the Porcelain Tile Certification Agency.
 - 2. Tile Color, Size, Glaze, and Pattern: See Finish Key.
 - 3. Grout Color: As selected by Architect from manufacturer's full range.

2.4 CRACK ISOLATION MEMBRANE

- A. General: Manufacturer's standard product that complies with ANSI A118.12 for high performance and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
- B. Crack Isolation Membrane and Tile-Setting Adhesive: One-part, fluid-applied product intended for use as both a crack isolation membrane and tile-setting adhesive in a two-step process.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Boiardi Products Corporation; a QEP company; Elastiment 324 Waterproofing, Anti-Fracture/Crack Suppressant and Tile Setting AdhesiveElastiment 326 100% Solids Polyurethane Waterproofing Membrane & Tile Setting Adhesive.
 - b. Bostik, Inc; Hydroment Ultra-Set Advanced.

2.5 SETTING MATERIALS

- A. Standard Dry-Set Mortar (Thinset): ANSI A118.1.
 - 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:
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Custom Building Products.
 - b. Laticrete International, Inc.
 - c. MAPEI Corporation.
 - 3. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.1.

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.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Custom Building Products.
 - b. Laticrete International, Inc.

CERAMIC TILING

c. MAPEI Corporation.

2.7 MISCELLANEOUS MATERIALS

- A. 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 flooring applications; half-hard brass exposed-edge material.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings Schluter Reno-TK or comparable product by one of the following:
 - a. Blanke Corporation.
 - b. Ceramic Tool Company, Inc.
 - c. Schluter Systems L.P.
- B. 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 concrete substrates for tile floors installed with adhesives [bonded mortar bed or thinset mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with adhesives or thinset mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.
- B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot toward drains.
- C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 CERAMIC TILE INSTALLATION

- A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
 - 1. For the following installations, follow procedures in the ANSI A108 series of tile installation standards for providing 95 percent mortar coverage:
 - a. Exterior tile floors.
 - b. Tile floors in wet areas.
 - c. Tile swimming pool decks.
 - d. Tile floors in laundries.
 - e. Tile floors consisting of tiles 8 by 8 inches or larger.
 - f. Tile floors consisting of rib-backed tiles.
- 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. Glazed Wall Tile: 1/8 inch.
 - 2. Porcelain Tile: 3/8 inch.
- 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.
 - 1. At locations where mortar bed (thickset) would otherwise be exposed above adjacent floor finishes, set thresholds in modified dry-set mortar (thinset).
 - 2. Do not extend cleavage membrane waterproofing or crack isolation membrane under thresholds set in standard dry-set mortar. Fill joints between such thresholds and adjoining tile set on cleavage membrane waterproofing or crack isolation membrane with elastomeric sealant.
- K. Metal Edge Strips: Install 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 and where exposed edge of wall tile meets gypsum wall that is below top of tile.
- 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 TILE BACKING PANEL INSTALLATION

A. Install panels and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated. Use modified dry-set mortar for bonding material unless otherwise directed in manufacturer's written instructions.

3.5 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.

3.6 CRACK ISOLATION MEMBRANE INSTALLATION

- A. Install a crack isolation membrane at floor tiles equal to, or larger than 12"x24" or 24 sq. inches.
- B. 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.
- C. Allow crack isolation membrane to cure before installing tile or setting materials over it.

3.7 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.

3.8 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. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.
- C. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

END OF SECTION 093013
SECTION 095123 - ACOUSTICAL TILE 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 tiles for interior ceilings.
- 2. Fully concealed, direct-hung, suspension systems.
- 3. Direct attachment of tiles to substrates with adhesive.
- 4. Direct attachment of tiles to substrates with staples.
- B. Related Requirements:
 - 1. Section 095113 "Acoustical Panel Ceilings" for ceilings consisting of mineral-base and glass-fiber-base acoustical panels and exposed suspension systems.
- C. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete.
- D. Alternates
 - 1. Prior Approval: Unless otherwise provided for in the Contract documents, proposed product substitutions may be submitted no later than TEN (10) working days prior to the date established for receipt of bids. Acceptability of a proposed substitution is contingent upon the Architect's review of the proposal for acceptability and approved products will be set forth by the Addenda. If included in a Bid are substitute products that have not been approved by Addenda, the specified products shall be provided without additional compensation.
 - 2. Submittals that do not provide adequate data for the product evaluation will not be considered. The proposed substitution must meet all requirements of this section, including but not necessarily limited to, the following: Single source materials suppliers (if specified in Section 1.5); Underwriters' Laboratories Classified Acoustical performance; Panel design, size, composition, color, and finish; Suspension system component profiles and sizes; Compliance with the referenced standards.

1.3 ACTION SUBMITTALS

- A. Product Data: Submit manufacturer's technical data for each type of acoustical ceiling unit and suspension system required.
- B. Samples: Minimum 6 inch x 6 inch samples of specified acoustical panel; 8 inch long samples of exposed wall molding and suspension system, including main runner and 4 foot cross tees.
- C. Shop Drawings: Layout and details of acoustical ceilings show locations of items that are to be coordinated with, or supported by the ceilings.
- D. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of sizes indicated below:
 - 1. Acoustical Tiles: Set of full-size Samples of each type, color, pattern, and texture.
 - 2. Concealed Suspension-System Members: 6-inch- long Sample of each type.
 - 3. Exposed Moldings and Trim: Set of 6-inch- long Samples of each type and color.
 - 4. Seismic Clips: Full size.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Product Test Reports: For each acoustical tile ceiling, for tests performed by a qualified testing agency.

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. Acoustical Ceiling Units: Full-size tiles equal to 5 percent of quantity installed.
 - 2. Suspension-System Components: Quantity of each concealed grid and exposed component equal to 5 percent of quantity installed.

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 materials and execution.
 - 1. Build mockup of typical ceiling area 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.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical tiles, suspension-system components, and accessories to Project site 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 tiles, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical ceiling units carefully to avoid chipping edges or damaged units in any way.

1.8 FIELD CONDITIONS

- A. Space Enclosure:
 - 1. Standard Ceilings: Do not install interior ceilings until space is enclosed and weatherproof; wet work in place is completed and nominally dry; work above ceilings is complete; and ambient conditions of temperature and humidity are continuously maintained at values near those intended for final occupancy. Building areas to receive ceilings shall be free of construction dust and debris.
 - 2. HumiGuard Plus Ceilings: Building areas to receive ceilings shall be free of construction dust and debris. Products with HumiGuard Plus performance and hot dipped galvanized steel, aluminum or stainless steel suspension systems can be installed up to 120°F (49°C) and in spaces before the building is enclosed, where HVAC systems are cycled or not operating. Cannot be used in exterior applications where standing water is present or where moisture will come in direct contact with the ceiling.
 - 3. HumiGuard Max Ceilings: Building areas to receive ceilings shall be free of construction dust and debris. Ceilings with HumiGuard Max performance can be installed in conditions up to 120°F (49°C) and maximum humidity exposure including outdoor applications, and other standing water applications, so long as they are installed with either SS Prelude Plus, AL Prelude Plus, or Prelude Plus Fire Guard XL suspension systems. Products with Humiguard Max performance can be installed in exterior applications, where standing water is present, or where moisture will come in direct contact with the ceiling. Only Ceramaguard with AL Prelude Plus suspension system can be installed over swimming pools.
- B. Environmental Limitations: Do not install acoustical tile ceilings until spaces are enclosed and weathertight, 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 tile ceiling installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations:
 - 1. Ceiling Panels: Armstrong World Industries, Inc.
 - 2. Suspension Systems: Armstrong World Industries, Inc.
 - 3. Perimeter Systems: Armstrong World Industries, Inc.

2.2 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: Class A according to ASTM E 1264.
 - 2. Smoke-Developed Index: 50 or less.

2.3 ACOUSTICAL TILES

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - 1. Armstrong World Industries, Inc.
- B. Acoustical Tile Standard: Provide manufacturer's standard tiles of configuration indicated that comply with ASTM E 1264 classifications as designated by type, form, pattern, acoustical rating, and light reflectance unless otherwise indicated.
- C. Noise Reduction Coefficient (NRC): Not less than NRC 0.65.
- D. Edge/Joint Detail: As indicated by manufacturer's designation. 7800 12' Wall Molding.
 - 1. Thickness: As indicated in a schedule.
- E. Modular Size: As indicated in a schedule Insert size.

2.4 METAL SUSPENSION SYSTEM

A. Basis-of-Design Product:: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

ACOUSTICAL TILE CEILINGS

- 1. Armstrong World Industries, Inc.
- B. Main beams and cross tees, base metal and end detail, fabricated from commercial quality hot dipped galvanized steel complying with ASTM A 653. Main beams and cross tees are double-web steel construction with type exposed flange design.
 Exposed surfaces chemically cleansed, capping prefinished galvanized steel in baked polyester paint. Main beams and cross tees shall have rotary stitching.
 - 1. Structural Classification: ASTM C 635 Heavy Duty duty
 - 2. Color: White and match the actual color of the selected ceiling tile, unless noted otherwise.
 - 3. Sustainability: Environmetal Product Declaration (EPD), Health Product Declaration (HPD)
 - 4. Acceptable Product: SUPRAFINE XL 9/16" Exposed Tee as manufactured by Armstrong World Industries

2.5 ACCESSORIES

- A. Attachment Devices: Size for five times the design load indicated in ASTM C 635/C 635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
 - 1. 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 according to ASTM E 488/E 488M or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency.
 - a. Type: Postinstalled bonded anchors.
 - b. Corrosion Protection: Carbon-steel components zinc plated according to ASTM B 633, Class SC 1 (mild) service condition.
 - c. Corrosion Protection: Stainless-steel components complying with ASTM F 593 and ASTM F 594, Group 1 Alloy 304 or 316.
 - 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] <Insert safety factor> times that imposed by ceiling construction, as determined by testing according to ASTM E 1190, conducted by a qualified testing and inspecting agency.
 - 3. 7905 9/16" Flush Act. to Drywall Transition Molding
 - 4. 7907 9/16" Tegular Act. to Drywall Transition Molding
- B. Wire Hangers, Braces, and Ties: Provide wires as follows:
 - 1. Stainless-Steel Wire: ASTM A 580/A 580M, Type 304, nonmagnetic.
- C. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.

- D. Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.
- E. Angle Hangers: Angles with legs not less than 7/8 inch wide; formed with 0.04-inchthick, galvanized-steel sheet complying with ASTM A 653/A 653M, G90 coating designation; with bolted connections and 5/16-inch- diameter bolts.

2.6 METAL EDGE MOLDINGS AND TRIM

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide [product indicated on Drawings] <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - 1. Armstrong World Industries, Inc.
- C. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations complying with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for of suspension-system runners.
 - 1. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.
 - 2. Finish: Painted to match color of acoustical unit.

2.7 MISCELLANEOUS MATERIALS

- A. Acoustical Tile Adhesive: Type recommended in writing by acoustical tile manufacturer, bearing UL label for Class 0-25 flame spread.
 - 1. Retain "Staples" Paragraph below for stapled tile.
- B. Staples: 5/16-inch- long, divergent-point staples.

PART 3 - EXECUTION

- 3.1 EXAMINATION
 - A. Examine substrates, areas, and conditions, including structural framing and substrates to which acoustical tile ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

- B. Do not proceed with installation until all wet work such as concrete, terrazzo, plastering and painting has been completed and thoroughly dried out, unless expressly permitted by manufacturer's printed recommendations. (Exception: HumiGuard Max Ceilings)
- C. Examine acoustical tiles before installation. Reject acoustical tiles that are wet, moisture damaged, or mold damaged.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Testing Substrates: Before adhesively bonding tiles to wet-placed substrates such as cast-in-place concrete or plaster, test and verify that moisture level is below tile manufacturer's recommended limits.
- B. Measure each ceiling area and establish layout of acoustical tiles to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width tiles at borders unless otherwise indicated, and comply with layout shown on reflected ceiling plans.
- C. Coordination: Furnish layouts for preset inserts, clips, and other ceiling anchors whose installation is specified in other sections.
 - 1. Furnish concrete inserts and similar devices to other trades for installation well in advance of time needed for coordination of other work.
- D. Layout openings for penetrations centered on the penetrating items.

3.3 INSTALLATION OF SUSPENDED ACOUSTICAL TILE CEILINGS

- A. Install suspended acoustical tile ceilings according to ASTM C 636/C 636M and manufacturer's written instructions.
- 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 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.

- 4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly to structure 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. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
- 6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
- 7. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
- 8. Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
- 9. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
- C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.
- D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical tiles.
 - 1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
 - 2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends. Miter corners accurately and connect securely.
 - 3. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- F. Arrange directionally patterned acoustical tiles as follows:
 - 1. As indicated on reflected ceiling plans.
 - 2.

- G. Install acoustical tiles in coordination with suspension system and exposed moldings and trim. Place splines or suspension-system flanges into kerfed edges of tiles so tile-to-tile joints are interlocked.
 - 1. Fit adjoining tiles to form flush, tight joints. Scribe and cut tiles for accurate fit at borders and around penetrations through ceiling.
 - 2. Hold tile field in compression by inserting leaf-type, spring-steel spacers between tiles and moldings, spaced 12 inches o.c.

3.4 INSTALLATION OF DIRECTLY ATTACHED ACOUSTICAL TILE CEILINGS

- A. Adhesive Installation: Install acoustical tile by bonding to substrate, using acoustical tile adhesive and procedure recommended in writing by tile manufacturer and as follows:
 - 1. Wipe and prime ceiling.
 - 2. Remove loose dust from backs of tiles by brushing.
 - 3. Install splines in joints between tiles and maintain bottom surface to a uniform level. Shim tile or correct substrate as required to maintain levelness.
 - 4. Maintain tight butt joints, aligned in both directions and coordinated with ceiling fixtures.
- B. Stapled Installation: Fasten acoustical tile to substrate using a minimum of two staples per tile that are installed in flanges of tile and as follows:
 - 1. Form double-lapped joint between tiles by securely pressing tile tongues into corresponding tile grooves.
 - 2. Maintain bottom surface of tiles to a uniform level. Shim tile or correct substrate as required to maintain levelness.
 - 3. Maintain tight butt joints, aligned in both directions and coordinated with ceiling fixtures.
- C. Install edge moldings and trim of type indicated at perimeter of acoustical tile ceiling area and where necessary to conceal edges of acoustical units.
- D. Arrange directionally patterned acoustical tiles [as indicated on Drawings] [with pattern running in one direction parallel to long axis of space] [with pattern running in one direction parallel to short axis of space] [in a basket-weave pattern] <Insert requirement>.

3.5 ERECTION TOLERANCES

- A. Suspended Ceilings: Install main and cross runners level to a tolerance of 1/8 inch in 12 feet, non-cumulative.
- B. Directly Attached Ceilings: Install bottom surface of tiles to a tolerance of 1/8 inch in 12 feet and not exceeding 1/4 inch cumulatively.

C. Moldings and Trim: Install moldings and trim to substrate and level with ceiling suspension system to a tolerance of 1/8 inch in 12 feet, non-cumulative.

3.6 ADJUSTING

- A. Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and suspension members. Comply with manufacturer's instructions for cleaning and touch up of minor finish damage. Remove any ceiling products that cannot be successfully cleaned and or repaired. Replace with attic stock or new product to eliminate evidence of damage.
- B. Remove and replace tiles and other ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 095123

SECTION 096516 - RESILIENT SHEET 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 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For each type of resilient sheet flooring.
 - 1. Include sheet flooring layouts, locations of seams, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
 - 2. Show details of special patterns.
- C. Samples: For each exposed product and for each color, texture, and pattern specified, in manufacturer's standard size, but not less than [6-by-9-inch] <Insert dimensions> sections.
 - 1. For heat-welding bead, manufacturer's standard-size Samples, but not less than [9 inches] <Insert dimension> long, of each color required.
- D. Samples for Initial Selection: For each type of resilient sheet flooring indicated.
- E. Samples for Verification: For each type of resilient sheet flooring, in manufacturer's standard size, but not less than [6-by-9-inch] <Insert dimensions> sections of each color, texture, and pattern required.
 - 1. For heat-welding bead, manufacturer's standard-size Samples, but not less than [9 inches] <Insert dimension> long, of each color required.
- F. Welded-Seam Samples: For seamless-installation technique indicated and for each resilient sheet flooring product, color, and pattern required; with seam running lengthwise and in center of [6-by-9-inch] <Insert dimensions> Sample applied to a rigid backing and prepared by Installer for this Project.
- G. Product Schedule: For resilient sheet flooring. [Use same designations indicated on Drawings.]

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of resilient sheet flooring 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. Resilient Sheet Flooring: Furnish not less than [10 linear feet] <Insert dimension> for every [500 linear feet] <Insert dimension> or fraction thereof, in roll form and in full roll width for each type, color, and pattern of flooring installed.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors 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 sheet flooring manufacturer for installation techniques required.
- B. 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.
 - a. Size: Minimum 100 sq. ft. for each type, color, and pattern [in locations indicated] [in locations directed by Architect] < Insert locations>.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store resilient sheet flooring and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store rolls upright.

1.8 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than [70 deg F] <Insert temperature> or more than [85 deg F] <Insert temperature>, in spaces to receive resilient sheet flooring 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] <Insert temperature> or more than [95 deg F] <Insert temperature>.
- C. Close spaces to traffic during resilient sheet flooring installation.
- D. Close spaces to traffic for 48 hours after resilient sheet flooring installation.
- E. Install resilient sheet flooring after other finishing operations, including painting, have been completed.

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 E 648 or NFPA 253 by a qualified testing agency.
 - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

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 sheet flooring.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to resilient sheet flooring manufacturer's written instructions to ensure adhesion of resilient sheet flooring.
- B. Concrete Substrates: Prepare according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by resilient sheet flooring manufacturer. Do not use solvents.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended by resilient sheet flooring manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than [9] [10] <Insert number> pH.
 - 4. Moisture Testing: Perform tests so that each test area does not exceed [200 sq. ft.] [1000 sq. ft.] <Insert area>, 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 Ib of water/1000 sq. ft.] <Insert rate> in 24 hours.
 - b. Relative Humidity Test: Using in-situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum [75] <Insert number> 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 sheet flooring until materials are the same temperature as space where they are to be installed.
 - 1. At least 48 hours in advance of installation, move flooring and installation materials into spaces where they will be installed.
- E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient sheet flooring.

3.3 RESILIENT SHEET FLOORING INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient sheet flooring.
- B. Unroll resilient sheet flooring and allow it to stabilize before cutting and fitting.
- C. 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.
- D. Scribe and cut resilient sheet flooring to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- E. Extend resilient sheet flooring into toe spaces, door reveals, closets, and similar openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on resilient sheet flooring as marked on substrates. Use chalk or other nonpermanent marking device.
- G. Install resilient sheet flooring on covers for telephone and electrical ducts and similar items in installation areas. Maintain overall continuity of color and pattern between pieces of flooring installed on covers and adjoining flooring. Tightly adhere flooring edges to substrates that abut covers and to cover perimeters.
- H. Adhere resilient sheet flooring 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.

3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting resilient sheet flooring.
- B. Perform the following operations immediately after completing resilient sheet flooring installation:
 - 1. Remove adhesive and other blemishes from surfaces.
 - 2. Sweep and vacuum surfaces thoroughly.
 - 3. Damp-mop surfaces to remove marks and soil.
- C. Protect resilient sheet flooring from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Cover resilient sheet flooring until Substantial Completion.

END OF SECTION 096516

SECTION 096519 - RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Solid vinyl floor tile.
 - 2. Rubber floor tile.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For each type of resilient floor tile.
 - 1. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
 - 2. Show details of special patterns.
- C. Samples: Full-size units of each color, texture, and pattern of floor tile required.
 - 1. For heat-welding bead, manufacturer's standard-size Samples, but not less than 9 inches long, of each color required.
- D. Samples for Initial Selection: For each type of floor tile indicated on Drawings.
- E. Samples for Verification: Full-size units of each color and pattern of floor tile required.
 - 1. For heat-welding bead, manufacturer's standard-size Samples, but not less than 9 inches long, of each color required.
- F. Welded-Seam Samples: For seamless-installation technique indicated and for each floor covering product, color, and pattern required; with seam running lengthwise and in center of 6-by-9-inch Sample applied to a rigid backing and prepared by Installer for this Project.
- G. Product Schedule: For floor tile. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of floor tile to include in maintenance manuals.

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. Floor Tile: Furnish one box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are competent in techniques required by manufacturer for floor tile installation and seaming method indicated.
 - 1. Engage an installer who employs workers for this Project who are trained or certified by floor tile manufacturer for installation techniques required.
- B. 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.
 - a. Size: Minimum 100 sq. ft.for each type, color, and pattern in locations indicated.
 - 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.
- C. 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. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store floor tiles on flat surfaces.

1.9 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 floor tile 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. Close spaces to traffic during floor tile installation.
- D. Close spaces to traffic for 48 hours after floor tile installation.
- E. Install floor tile after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

- 2.1 PERFORMANCE REQUIREMENTS
 - A. Fire-Test-Response Characteristics: For resilient floor tile, as determined by testing identical products according to ASTM E 648 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 SOLID VINYL FLOOR TILE
 - A. Products: Subject to compliance with requirements, provide the following:
 - 1. See finish key on Drawings for specifications.
 - B. Tile Standard: ASTM F 1700.
 - 1. Class: As indicated by product designations.

RESILIENT TILE FLOORING

- 2. Type: B, Embossed Surface.
- C. Thickness: See product data for vinyl products in finish key.
- D. Size: See finish key on Drawings, sizes vary..
- E. Seamless-Installation Method: Chemically bonded.
- F. Colors and Patterns: As indicated in finish key on Drawings.

2.3 RUBBER FLOOR TILE

- A. Products: Subject to compliance with requirements, provide the following:
 - 1. See finish Key.
- B. Tile Standard: ASTM F 1344, Class I-A, Homogeneous Rubber Tile, solid color Class I-B, Homogeneous Rubber Tile, through mottled.
- C. Hardness: Manufacturer's standard hardness, measured using Shore, Type A durometer according to ASTM D 2240.
- D. Wearing Surface: See finish schedule .
- E. Thickness: See product data for rubber products in finish key.
- F. Size: See product data for vinyl products in finish key.
- G. Seamless-Installation Method: Chemically bonded.
- H. Colors and Patterns: See finish key on Drawings.

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 floor tile manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.
- C. Seamless-Installation Accessories:
 - 1. Chemical-Bonding Compound: Manufacturer's product for chemically bonding seams.
- D. Floor Polish: Provide protective, liquid floor-polish products recommended by floor tile 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 floor tile.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates: Prepare according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 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 Ib 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. Access Flooring Panels: Remove protective film of oil or other coating using method recommended by access flooring manufacturer.
- D. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

- E. Do not install floor tiles until materials are the same temperature as space where they are to be installed.
 - 1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.
- F. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.3 FLOOR TILE INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor tile.
- B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
 - 1. Lay tiles in pattern indicated on Drawings.
- C. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- D. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.
- E. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.
- F. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in installation areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.
- G. Adhere floor tiles to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.
- H. Seamless Installation:
 - 1. Heat-Welded Seams: Comply with ASTM F 1516. Rout joints and heat weld with welding bead to fuse sections permanently into a seamless flooring installation. Prepare, weld, and finish seams to produce surfaces flush with adjoining flooring surfaces.
 - 2. Chemically Bonded Seams: Bond seams with chemical-bonding compound to fuse sections permanently into a seamless flooring installation. Prepare seams and apply compound to produce tightly fitted seams without gaps, overlays, or excess bonding compound on flooring surfaces.

3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.
- B. Perform the following operations immediately after completing floor tile installation:
 - 1. Remove adhesive and other blemishes from surfaces.
 - 2. Sweep and vacuum surfaces thoroughly.
 - 3. Damp-mop surfaces to remove marks and soil.
- C. Protect floor tile from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Floor Polish: Remove soil, adhesive, and blemishes from floor tile surfaces before applying liquid floor polish.
 - 1. Apply two coat(s).
- E. Joint Sealant: Apply sealant to resilient terrazzo floor tile perimeter and around columns, at door frames, and at other joints and penetrations.
- F. Sealers and Finish Coats: Remove soil, visible adhesive, and surface blemishes from resilient terrazzo floor tile surfaces before applying liquid cleaners, sealers, and finish products.
 - 1. Sealer: Apply two base coats of liquid sealer.
 - 2. Finish: Apply two coats of liquid floor finish.
- G. Cover floor tile until Substantial Completion.

END OF SECTION 096519

SECTION 099113 - EXTERIOR 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. Section includes surface preparation and the application of paint systems on exterior substrates including, but not limited to:
 - 1. Concrete.
 - 2. Concrete masonry units (CMUs).
 - 3. Steel and iron.
 - 4. Galvanized metal.
 - 5. Aluminum (not anodized or otherwise coated).
 - 6. Wood.
 - 7. Gypsum board
 - 8. Fiber Cement.
- B. Related Requirements:
 - 1. Section 055000 "Metal Fabrications" for shop priming metal fabrications.
 - 2. Section 055116 "Metal Floor Plate Stairs" for shop priming metal floor plate stairs.
 - 3. Section 055119 "Metal Grating Stairs" for shop priming metal grating stairs.
 - 4. Section 055213 "Pipe and Tube Railings" for shop [priming] [painting] pipe and tube railings.
 - 5. Section 099300 "Staining and Transparent Finishing" for surface preparation and the application of wood stains and transparent finishes on exterior wood substrates.

1.3 DEFINITIONS

- A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
- B. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- C. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
- D. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.

EXTERIOR PAINTING

- E. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
- F. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
 - 1. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
 - 2. Indicate VOC content.
- B. Samples for Initial Selection: For each type of topcoat product.
- C. Samples for Verification: For each type of paint system and each color and gloss of topcoat.
 - 1. Submit Samples on rigid backing, 8 inches square.
 - 2. Apply coats on Samples in steps 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: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

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. Paint: 1 percent, but not less than 1 gal. of each material and color applied.

1.6 QUALITY ASSURANCE

- A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Architect will select one surface to represent surfaces and conditions for application of each paint system.
 - a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft..
 - b. Other Items: Architect will designate items or areas required.
 - 2. Final approval of color selections will be based on mockups.

- a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
- 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
- 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
 - 1. Maintain containers in clean condition, free of foreign materials and residue.
 - 2. Remove rags and waste from storage areas daily.

1.8 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings and listed in the Exterior Painting Schedule Section 3.5 or comparable product by one of the following:
 - 1. Benjamin Moore & Co.
 - 2. Rust-Oleum Corporation; a subsidiary of RPM International, Inc.
 - 3. Sherwin-Williams Company (The).
 - 4. Zinsser; Rust-Oleum Corporation.

2.2 PAINT, GENERAL

- A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."
- B. Material Compatibility:

- 1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
- 2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
- C. VOC Content: For field applications, paints and coatings shall comply with VOC content limits of authorities having jurisdiction.
- D. Colors: As indicated in a color schedule.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Portland Cement Plaster Substrates: Verify that plaster is fully cured.
- C. Exterior Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- D. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
- E. Proceed with coating application only after unsatisfactory conditions have been corrected.
 - 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

- 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.
- F. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- G. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- H. Aluminum Substrates: Remove loose surface oxidation.
- I. Wood Substrates:
 - 1. Scrape and clean knots. Before applying primer, apply coat of knot sealer recommended in writing by topcoat manufacturer for exterior use in paint system indicated.
 - 2. Sand surfaces that will be exposed to view, and dust off.
 - 3. Prime edges, ends, faces, undersides, and backsides of wood.
 - 4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.
- J. Plastic Trim Fabrication Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."
 - 1. Use applicators and techniques suited for paint and substrate indicated.
 - 2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
 - 3. Paint both sides and all edges of exterior doors and entire exposed surface of exterior door frames.
 - 4. Paint entire exposed surface of window frames and sashes.
 - 5. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

MasterSpec

- 6. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. Tint undercoats same color as topcoat, but tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
 - 1. Paint the following work where exposed to view:
 - a. Equipment, including panelboards and switch gear.
 - b. Uninsulated metal piping.
 - c. Uninsulated plastic piping.
 - d. Pipe hangers and supports.
 - e. Metal conduit.
 - f. Plastic conduit.
 - g. Tanks that do not have factory-applied final finishes.
 - h. Sprinkler Pipe (Not Heads).

3.4 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.5 EXTERIOR PAINTING SCHEDULE

- A. Concrete Substrates, Traffic Surfaces:
 - 1. Clear Water-Based Sealer System[MPI EXT 3.2H]:

MasterSpec

- a. Prime Coat: Sealer, water based, matching topcoat.
- b. Intermediate Coat: Sealer, water based, matching topcoat.
- c. Topcoat: Sealer, water based, for concrete floors[, MPI #99].
 - 1) <Insert manufacturer's name; product name or designation>.

B. CMU Substrates:

- 1. High-Build Latex System MPI EXT 4.2K: Dry film thickness of not less than 10 mils.
 - a. Prime Coat: S-W Loxon XP Waterproofing System, A24-1400 Series (14.0-18.0 mils wet; 6.4-8.3 mils dry.
- C. Top CoatS-W Loxon XP Waterproofing System, A24-1400 Series (14.0-18.0 mils wet; 6.4-8.3 mils drySteel and Iron Substrates:
 - 1. Alkyd System MPI EXT 5.1D:
 - a. Prime Coat: Primer, metal, surface tolerant, MPI #23.

S-W Pro Industrial Pro-Cryl Universal primer, B66-1310 Series 5.0-10.0 mils wet; 1.8-3.6 mils dry

- b. Intermediate Coat: Exterior, alkyd enamel, matching topcoat.
- c. Topcoat: Alkyd, exterior, Semi-Gloss.
- D. S-W Pro Industrial Water Based Alkyd Urethane Enamel B53-1150 Series 4.0-5.0 mils wet; 1.4-1.7 mils dry Aluminum Substrates:
 - 1. Alkyd System MPI EXT 5.4A MPI EXT 5.4F:
 - a. Prime Coat: Primer, quick dry, for aluminum, MPI #95.
 - b. S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series 5.0-10.0 mils wet; 1.8-3.6 mils dryIntermediate Coat: Exterior, alkyd enamel, matching topcoat.
 - c. Topcoat: Alkyd, exterior, Semi-Gloss.

S-W Pro Industrial Water Based Alkyd Urethane Enamel B53-1150 Series 4.0-5.0 mils wet; 1.4-1.7 mils dry

- E. Wood Substrates: Architectural woodwork.
 - 1. Water-Based Light Industrial Coating System MPI EXT 6.3J:
 - a. Prime Coat: Primer, Urethane for exterior wood, MPI #5.
 - 1) Sherwin Williams Minwax Water Based Helmsman Indoor/Outdoor Spar Urethane - Semi-Gloss.
 - b. Intermediate Coat: Light industrial coating, exterior, water based, matching topcoat.

- c. Topcoat: Light industrial coating, exterior, water based, semi-gloss (MPI Gloss Level 6), MPI #163.
 - 1) Sherwin Williams Minwax Water Based Helmsman Indoor/Outdoor Spar Urethane Semi-Gloss.
- F. Exterior Gypsum Board Substrates:
 - 1. Multi-Surface Acrylic System:
 - a. Prime Coat:
 - 1) S-W Pro Industrial multi-Surface Acrylic Semi-Gloss, B66-1550 Series
 - b. Top Coat:
 - 1) S-W Pro Industrial Multi-Surface Acrylic Semi-Gloss, B66-1550 Series 3.75-5.0 mils wet; 1.5-2.0 mils dry.

END OF SECTION 099113

SECTION 099123 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes surface preparation and the application of paint systems on interior substrates.
 - 1. Concrete.
 - 2. Cement board.
 - 3. Concrete masonry units (CMUs).
 - 4. Steel and iron.
 - 5. Galvanized metal.
 - 6. Aluminum (not anodized or otherwise coated).
 - 7. Stainless steel.
 - 8. Wood.
 - 9. Gypsum board.
 - 10. Acoustic panels and tiles.
- B. Related Requirements:
 - 1. Section 051200 "Structural Steel Framing" Section 051213 "Architecturally Exposed Structural Steel Framing" for shop priming structural steel.
 - 2. Section 055000 "Metal Fabrications" for shop priming metal fabrications.
 - 3. Section 055113 "Metal Pan Stairs" for shop priming metal pan stairs.
 - 4. Section 055116 "Metal Floor Plate Stairs" for shop priming metal floor plate stairs.
 - 5. Section 055119 "Metal Grating Stairs" for shop priming metal grating stairs.
 - 6. Section 055213 "Pipe and Tube Railings" for shop [priming] [painting] pipe and tube railings.
 - Section 055313 "Bar Gratings" Section 055316 "Plank Gratings" Section 055319 "Expanded Metal Gratings" for shop priming metal gratings.
 - 8. Section 099600 "High-Performance Coatings" for tile-like coatings.
 - 9. Section 099300 "Staining and Transparent Finishing" for surface preparation and the application of wood stains and transparent finishes on interior wood substrates.

1.3 DEFINITIONS

A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.

INTERIOR PAINTING

- B. MPI Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- C. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- D. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
- E. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
- F. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
- G. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
 - 1. Include Printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
 - 2. Indicate VOC content.
- B. Samples for Initial Selection: For each type of topcoat product.
- C. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

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. Paint: 5 percent, but not less than 1 gal. of each material and color applied.

1.6 QUALITY ASSURANCE

- A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Architect will select one surface to represent surfaces and conditions for application of each paint system.
 - a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft..
 - b. Other Items: Architect will designate items or areas required.

- 2. Final approval of color selections will be based on mockups.
 - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
- 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
- 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
 - 1. Maintain containers in clean condition, free of foreign materials and residue.
 - 2. Remove rags and waste from storage areas daily.

1.8 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide product listed in the Interior Painting Schedule for the paint category indicated.

2.2 PAINT, GENERAL

- A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."
- B. Material Compatibility:
 - 1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.

- C. VOC Content: For field applications that are inside the weatherproofing system, paints and coatings shall comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:
 - 1. Flat Paints and Coatings: 50 g/L.
 - 2. Nonflat Paints and Coatings: 50 g/L.
 - 3. Dry-Fog Coatings: 150 g/L.
 - 4. Primers, Sealers, and Undercoaters: 100 g/L.
 - 5. Rust-Preventive Coatings: 100 g/L.
 - 6. Zinc-Rich Industrial Maintenance Primers: 100 g/L.
 - 7. Pretreatment Wash Primers: 420 g/L.
 - 8. Shellacs, Clear: 730 g/L.
 - 9. Shellacs, Pigmented: 550 g/L.
- D. Low-Emitting Materials: For field applications that are inside the weatherproofing system, 90 percent of paints and coatings 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."
- E. Colors: As indicated in a color schedule.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - 1. Concrete: 12 percent.
 - 2. Fiber-Cement Board: 12 percent.
 - 3. Masonry (Clay and CMUs): 12 percent.
 - 4. Wood: 15 percent.
 - 5. Gypsum Board: 12 percent.
 - 6. Plaster: 12 percent.
- C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- D. Plaster Substrates: Verify that plaster is fully cured.
- E. Spray-Textured Ceiling Substrates: Verify that surfaces are dry.
- F. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.

- G. Proceed with coating application only after unsatisfactory conditions have been corrected.
 - 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.
- F. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer
- G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- H. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- I. Aluminum Substrates: Remove loose surface oxidation.
- J. Wood Substrates:
 - 1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
 - 2. Sand surfaces that will be exposed to view, and dust off.
 - 3. Prime edges, ends, faces, undersides, and backsides of wood.

MasterSpec

4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."
 - 1. Use applicators and techniques suited for paint and substrate indicated.
 - 2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 - 3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
 - 4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
 - 5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
 - 1. Do Not Paint the following work where exposed in equipment rooms:
 - a. Equipment, including panelboards and switch gear.
 - b. Uninsulated metal piping.
 - c. Uninsulated plastic piping.
 - d. Pipe hangers and supports.
 - e. Metal conduit.
 - f. Plastic conduit.
 - g. Tanks that do not have factory-applied final finishes.
 - h. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
 - 2. Paint the following work where exposed in occupied spaces:
 - a. Equipment, including panelboards.
 - b. Uninsulated metal piping.
 - c. Uninsulated plastic piping.
 - d. Pipe hangers and supports.
- e. Metal conduit.
- f. Plastic conduit.
- g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.

3.4 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.5 INTERIOR PAINTING SCHEDULE

- A. Concrete Substrates, Traffic Surfaces:
 - 1. Concrete Stain System MPI INT 3.2E:
 - a. First Coat: Stain, interior, for concrete floors, matching topcoat.
 - b. Topcoat: Stain, interior, for concrete floors, MPI #58.
 - 1) See Finish Key.
- B. Steel Substrates:
 - 1. Alkyd System Water based High Traffic Areas Handrails
 - a. Prime Coat: Primer
 - 1) Sherwin Williams Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0-10.0 mils wet, 1.8-3.6 mils dry)
 - b. Intermediate Coat: Alkyd, Semi-Gloss, Matching Topcoat
 - c. Topcoat: Alkyd, Semi-Gloss
 - 1) Sherwin Williams Pro Industrial Water Based Alkyd Urethane Enamel Semi-Gloss, B53-1150 Series (4.0-5.0 mils wet, 1.4-1.7 mils dry per coat)
 - 2) See finish key.
 - 2. Structural and Low Traffic Areas Latex over Shop-Applied Quick-Drying Shop Primer System MPI INT 5.1X:

INTERIOR PAINTING

- a. Prime Coat: Primer, quick dry, for shop application, MPI #275.
 - 1) Sherwin Williams Pro-Cryl Universal Primer, B66-1310 Series (5.0-10.0 mils wet, 1.8-3.6 mils dry).
- b. Intermediate Coat: Latex, interior, matching topcoat.
- c. Topcoat: Latex, interior (MPI Gloss Level 3), MPI #52.
 - 1) Sherwin Williams Pro Industrial DTM Acrylic Semi-Gloss, B66 Series (6.0-10.0 mils wet, 2.5-4.0 mils dry per coat).
 - 2) See finish key.
- C. Wood Substrates: Wood trim Architectural woodwork Doors and wood board paneling.
 - 1. Institutional Low-Odor/VOC Latex System MPI INT 6.3V:
 - a. Prime Coat: Primer, latex, for interior wood, MPI #39.
 - 1) Sherwin Williams ProMar 200 Zero VOC Interior Latex Primer.
 - b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
 - c. Topcoat: Latex, interior, institutional low odor/VOC, Semi-Gloss (MPI Gloss Level 3), MPI #145.
 - 1) Sherwin Williams Pro-Mar 200 Zero VOC Interior Latex Paint.
 - 2) See finish key.
- D. Gypsum Board and Plaster Substrates:
 - 1. Institutional Low-Odor/VOC Latex System MPI INT 9.2M PNT -A:
 - a. Prime Coat: Primer sealer, interior, institutional low odor/VOC, MPI #149.
 - 1) Sherwin Williams ProMar 200 Zero VOC Interior Latex Primer.
 - b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
 - c. Topcoat: Latex, interior, institutional low odor/VOC, Flat/Satin See Finish Key (MPI Gloss Level 1), MPI #143.
 - 1) Sherwin Williams Pro-Mar 200 Zero VOC Interior Latex Paint -Flat/Satin - See Finish Key .
 - 2) See finish key.
 - 2. Institutional Low-Odor/VOC Latex System MPI INT 9.2M PNT -B, C & D:
 - a. Prime Coat: Primer sealer, interior, institutional low odor/VOC, MPI #149.
 - 1) Sherwin Williams ProMar 200 Zero VOC Interior Latex Primer.

- b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
- c. Topcoat: Latex, interior, institutional low odor/VOC, Eggshell (MPI Gloss Level 2), MPI #144.
 - 1) Sherwin Williams Pro-Mar 200 Zero VOC Interior Latex Paint Eggshell .
 - 2) See finish key.
- 3. Institutional Low-Odor/VOC Latex System MPI INT 9.2M PNT E & F:
 - a. Prime Coat: Primer sealer, interior, institutional low odor/VOC, MPI #149.
 - 1) Sherwin Williams ProMar 200 Zero VOC Interior Latex Primer.
 - b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
 - c. Topcoat: Latex, interior, institutional low odor/VOC, Semi-Gloss (MPI Gloss Level 3), MPI #144.
 - 1) Sherwin Williams Pro-Mar 200 Zero VOC Interior Latex Paint -Semi-Gloss .
 - 2) See finish key.
- 4. Water-Based Light Industrial Coating System [MPI_INT_9.2L]:
 - a. Prime Coat: Primer sealer, latex, interior[, MPI #50].
 - b. Intermediate Coat: Light industrial coating, interior, water based, polyurethane/acrylic base coat and cross linker.
 - 1) Scuffmaster MC100
 - c. Topcoat: Light industrial coating, interior, water based polyurethane/acrylic effect coat and cross-linker.
 - 1) Scuffmaster Pearl Coat.
 - 2) See finish key.
 - d. Topcoat: Light industrial coating, interior, water based, polyurethane protective clear coat with cross-linker(MPI Gloss Level 5)[, MPI #153].
 - 1) Scuffmaster Ultra-Clear Flat.

END OF SECTION 099123

SECTION 099300 - STAINING AND TRANSPARENT 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 surface preparation and application of wood stains and transparent finishes on the following substrates:
 - 1. Exterior Substrates:
 - a. Exposed framing.
 - b. Dressed lumber (finish carpentry or woodwork).
 - c. Wood-based panel products.
 - d. Wood decks and stairs.
 - e. Wood shingles and shakes (excluding roofs).
 - 2. Interior Substrates:
 - a. Exposed framing.
 - b. Dressed lumber (finish carpentry or woodwork).
 - c. Wood-based panel products.
 - d. Wood floors and stairs.
 - e. Wood shingles and shakes.
- B. Related Requirements:
 - 1. Section 099123 "Interior Painting" for stains and transparent finishes on concrete floors.
 - 2. Section 099600 "High-Performance Coatings" for transparent high-performance coatings on concrete floors and clay masonry.

1.3 DEFINITIONS

- A. MPI Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
- B. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
- C. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.

- D. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
- E. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
 - 1. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
 - 2. Indicate VOC content.
- B. Samples for Initial Selection: For each type of product.
- C. Samples for Verification: For each type of finish system and in each color and gloss of finish required.
 - 1. Submit Samples on representative samples of actual wood substrates, 8 inches or 8 inches long.
 - 2. Apply coats on Samples in steps 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: Cross-reference to finish system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

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. Stains and Transparent Finishes: 5 percent, but not less than 1 gal. of each material and color applied.

1.6 QUALITY ASSURANCE

- A. Mockups: Apply mockups of each finish system indicated and each color selected to verify preliminary selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 - 1. Architect will select one surface to represent surfaces and conditions for application of each type of finish system and substrate.
 - a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft..
 - b. Other Items: Architect will designate items or areas required.

- 2. Final approval of stain color selections will be based on mockups.
 - a. If preliminary stain color selections are not approved, apply additional mockups of additional stain colors selected by Architect at no added cost to Owner.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
 - 1. Maintain containers in clean condition, free of foreign materials and residue.
 - 2. Remove rags and waste from storage areas daily.

1.8 FIELD CONDITIONS

- A. Apply finishes only when temperature of surfaces to be finished and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply finishes when relative humidity exceeds 85 percent, at temperatures less than 5 deg F above the dew point, or to damp or wet surfaces.
- C. Do not apply exterior finishes in snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Minwax Water Based Wood Stain or comparable product by one of the following:
 - 1. Behr Process Corporation.
 - 2. Benjamin Moore & Co.
 - 3. Duron, Inc.
 - 4. Frazee Paint; Comex Group.
 - 5. Glidden Professional.
 - 6. Kelly-Moore Paint Company Inc.
 - 7. Kwal Paint; Comex Group.
 - 8. Lenmar Lacquers; Benjamin Moore & Co.
 - 9. Pratt & Lambert.
 - 10. Rodda Paint Co.
 - 11. Rust-Oleum Corporation; a subsidiary of RPM International, Inc.
 - 12. Sherwin-Williams Company (The).
 - 13. Zinsser; Rust-Oleum Corporation.

2.2 MATERIALS, GENERAL

- A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products List."
- B. Material Compatibility:
 - 1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. For each coat in a paint system, products shall be recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- C. VOC Content: For field applications that are inside the weatherproofing system, paints and coatings shall comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:
 - 1. Primers, Sealers, and Undercoaters: 100 g/L.
 - 2. Clear Wood Finishes, Varnishes: 275 g/L.
 - 3. Clear Wood Finishes, Lacquers: 275 g/L.
 - 4. Shellacs, Clear: 730 g/L.
 - 5. Stains: 100 g/L.
- D. Stain Colors: As indicated in a color schedule.

2.3 SOURCE QUALITY CONTROL

- A. Testing of Materials: Owner reserves the right to invoke the following procedure:
 - 1. Owner will engage the services of a qualified testing agency to sample wood finishing materials. Contractor will be notified in advance and may be present when samples are taken. If materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
 - 2. Testing agency will perform tests for compliance with product requirements.
 - 3. Owner may direct Contractor to stop applying wood finishes if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying materials from Project site, pay for testing, and refinish surfaces finished with rejected materials. Contractor will be required to remove rejected materials from previously finished surfaces before refinishing with complying materials if the two finishes are incompatible or produce results that, in the opinion of the Architect, are aesthetically unacceptable.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- C. Proceed with finish application only after unsatisfactory conditions have been corrected.
 - 1. Beginning finish application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and finishing.
 - 1. After completing finishing operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean and prepare surfaces to be finished according to manufacturer's written instructions for each substrate condition and as specified.
 - 1. Remove dust, dirt, oil, and grease by washing with a detergent solution; rinse thoroughly with clean water and allow to dry. Remove grade stamps and pencil marks by sanding lightly. Remove loose wood fibers by brushing.
 - 2. Remove mildew by scrubbing with a commercial wash formulated for mildew removal and as recommended by stain manufacturer.
- D. Interior Wood Substrates:
 - 1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
 - 2. Apply wood filler paste to open-grain woods, as defined in "MPI Architectural Painting Specification Manual," to produce smooth, glasslike finish.
 - 3. Sand surfaces exposed to view and dust off.
 - 4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dry.

3.3 APPLICATION

- A. Apply finishes according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."
 - 1. Use applicators and techniques suited for finish and substrate indicated.
 - 2. Finish surfaces behind movable equipment and furniture same as similar exposed surfaces.
 - 3. Do not apply finishes over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
- B. Apply finishes to produce surface films without cloudiness, holidays, lap marks, brush marks, runs, ropiness, or other surface imperfections.

3.4 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing finish application, clean spattered surfaces. Remove spattered materials by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from finish application. Correct damage by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced finished wood surfaces.

3.5 INTERIOR WOOD -FINISH-SYSTEM SCHEDULE

- A. Wood Substrates: Wood trim architectural woodwork doors wood board paneling.
 - 1. Water-Based Varnish over Stain System MPI INT 6.3W:
 - a. Stain Coat: Stain, semitransparent, for interior wood, MPI #90.
 - 1) Sherwin Williams Minwax Water Based Wood Stain .
 - b. First Intermediate Coat: Water-based varnish matching topcoat.
 - c. Topcoat: Varnish, water based, oil modified polyurethane clear, satin (MPI Gloss Level 4), MPI #128.
 - 1) Sherwin Williams Minwax Water Based, Oil-Modified Polyurethane -Satin Finish.
- B. Wood Substrates: Traffic surfaces including stairs.

- 1. Water Based Varnish over Stain System MPI INT 6.5B:
 - a. Stain Coat: Stain, semitransparent, for interior wood, MPI #90.
 - 1) Sherwin Williams Wood Classics 250 VOC Interior Oil Stain.
 - b. First Intermediate Coat: Water Based varnish matching topcoat.
 - c. Second Intermediate Coat: Water Based varnish matching topcoat.
 - d. Topcoat: Varnish, interior, Water Based (MPI Gloss Level 6), MPI #56.
 - 1) Bona Traffic HD Waterborne Wood Floor Finish Satin.

END OF SECTION 099300

SECTION 101423.13 - ROOM-IDENTIFICATION SIGNAGE

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 room-identification signs that are directly attached to the building.

1.3 DEFINITIONS

A. Accessible: In accordance with the accessibility standard.

1.4 COORDINATION

- A. Furnish templates for placement of sign-anchorage devices embedded in permanent construction by other installers.
- B. Furnish templates for placement of electrical service embedded in permanent construction by other installers.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For room-identification signs.
 - 1. Include fabrication and installation details and attachments to other work.
 - 2. Show sign mounting heights, locations of supplementary supports to be provided by other installers, and accessories.
 - 3. Show message list, typestyles, graphic elements[, including raised characters and Braille], and layout for each sign at least [half size].
- C. Samples for Initial Selection: For each type of sign assembly, exposed component, and exposed finish.
 - 1. Include representative Samples of available typestyles and graphic symbols.
- D. Product Schedule: For room-identification signs. Use same designations indicated on Drawings or specified.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For signs to include in maintenance manuals.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.9 FIELD CONDITIONS

A. Field Measurements: Verify locations of anchorage devices and electrical service embedded in permanent construction by other installers by field measurements before fabrication, and indicate measurements on Shop Drawings.

1.10 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Deterioration of finishes beyond normal weathering.
 - b. Deterioration of embedded graphic image.
 - c. Separation or delamination of sheet materials and components.
 - 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Accessibility Standard: Comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design", the ABA standards of the Federal agency having jurisdiction and ICC A117.1.

2.2 ROOM-IDENTIFICATION SIGNS

- A. Room-Identification Sign Insert drawing designation: Sign Sign system with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:
 - 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. ACE Sign Systems, Inc.
 - b. ASI Sign Systems, Inc.
 - c. Best Sign Systems, Inc.
 - d. Mohawk Sign Systems.
 - e. Poblocki Sign Company, LLC.
 - f. Signature Signs, Inc.
 - g. Signs & Decal Corp.
 - h. Vista System.
 - 2. Laminated-Sheet Sign: Photopolymer Sandblasted polymer Insert material face sheet with raised graphics laminated over subsurface graphics to acrylic phenolic Insert material backing sheet to produce composite sheet.
 - a. Composite-Sheet Thickness: Manufacturer's standard for size of sign
 - b. Surface-Applied Graphics: Applied vinyl film
 - c. Subsurface Graphics: Reverse etch image S
 - d. Color(s): As selected by Architect from manufacturer's full ranget.
 - 3. Sign-Panel Perimeter: Finish edges smooth.
 - a. Edge Condition at Vertical Edges at Horizontal Edges: s Square cut .
 - b. Corner Condition in Elevation: Square.
 - 4. Mounting: Surface mounted to wall with concealed anchors countersunk flathead through fasteners
 - 5. Text and Typeface: Accessible raised characters and Braille Times Roman as selected by Architect from manufacturer's full range variable content as scheduled . Finish raised characters to contrast with background color, and finish Braille to match background color.

2.3 SIGN 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. Acrylic Sheet: ASTM D 4802, category as standard with manufacturer for each sign, Type UVF (UV filtering).

- D. Vinyl Film: UV-resistant vinyl film with pressure-sensitive, permanent adhesive; die cut to form characters or images as indicated on Drawings and suitable for exterior applications.
- E. 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 signs, noncorrosive and compatible with each material joined, and complying with the following:
 - 1. Use concealed fasteners and anchors unless indicated to be exposed.
 - 2. Sign Mounting Fasteners:
 - a. Concealed Studs: Concealed (blind), threaded studs welded or brazed to back of sign material or screwed into back of sign assembly unless otherwise indicated.
 - b. Through Fasteners: Exposed metal fasteners matching sign finish, with type of head indicated, and installed in predrilled holes.
- B. Adhesive: As recommended by sign manufacturer.
- C. Two-Face Tape: Manufacturer's standard high-bond, foam-core tape, 0.045 inch thick, with adhesive on both sides.
- D. Hook-and-Loop Tape: Manufacturer's standard two-part tape consisting of hooked part on sign back and looped side on mounting surface.

2.5 FABRICATION

- A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.
 - 1. Preassemble signs and assemblies in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
 - 2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
 - 3. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
 - 4. Provide rabbets, lugs, and tabs necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.
- B. 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.

C. Subsurface-Etched Graphics: Reverse etch back face of clear face-sheet material. Fill resulting copy with manufacturer's standard enamel. Apply opaque manufacturer's standard background color coating over enamel-filled copy.

2.6 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.

2.7 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, Class I, 0.018 mm Class II, 0.010 mm or thicker.
- B. Color Anodic Finish: AAMA 611, Class I, 0.018 mm Class II, 0.010 mm or thicker.
- C. 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.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.
 - 1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
 - 2. Install signs so they do not protrude or obstruct according to the accessibility standard.
 - 3. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
- B. Accessibility: Install signs in locations on walls as indicated on Drawings.
- C. Mounting Methods:
 - 1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.

- a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place sign in position and push until flush to surface, embedding studs in holes. Temporarily support sign in position until adhesive fully sets.
- b. Thin or Hollow Surfaces: Place sign in position and flush to surface, install washers and nuts on studs projecting through opposite side of surface, and tighten.
- 2. Through Fasteners: Drill holes in substrate using predrilled holes in sign as template. Countersink holes in sign if required. Place sign in position and flush to surface. Install through fasteners and tighten.
- 3. Adhesive: Clean bond-breaking materials from substrate surface and remove loose debris. Apply linear beads or spots of adhesive symmetrically to back of sign and of suitable quantity to support weight of sign after cure without slippage. Keep adhesive away from edges to prevent adhesive extrusion as sign is applied and to prevent visibility of cured adhesive at sign edges. Place sign in position, and push to engage adhesive. Temporarily support sign in position until adhesive fully sets.
- 4. Two-Face Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage. Keep strips away from edges to prevent visibility at sign edges. Place sign in position, and push to engage tape adhesive.
- 5. Hook-and-Loop Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply sign component of two-part tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage; push to engage tape adhesive. Keep tape strips Insert dimension away from edges to prevent visibility at sign edges when sign is initially installed or reinstalled. Apply substrate component of tape to substrate in locations aligning with tape on back of sign; push and rub well to fully engage tape adhesive to substrate.

3.2 ADJUSTING AND CLEANING

- A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.
- B. Remove temporary protective coverings and strippable films as signs are installed.
- C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 101423.13

SECTION 102800 - TOILET, BATH, AND LAUNDRY 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 washroom accessories.
 - 2. Private-use bathroom accessories.
 - 3. Custodial accessories.
- B. Related Requirements:
 - 1. Section 088300 "Mirrors" for frameless mirrors.
 - 2. Section 093013 "Ceramic Tiling" for ceramic toilet and bath 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. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
 - 2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
 - 3. Include electrical characteristics.
- B. Samples: Full size, for each exposed product and for each finish specified.
 - 1. Approved full-size Samples will be returned and may be used in the Work.

- C. 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.

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: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

- 2.1 OWNER-FURNISHED MATERIALS
 - A. Owner-Furnished Materials: .
- 2.2 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.
- 2.3 PUBLIC-USE WASHROOM ACCESSORIES
 - A. Source Limitations: Obtain public-use washroom accessories from single source from single manufacturer.
 - B. Toilet Tissue (Double-Roll) Dispenser :
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. American Specialties, Inc.; ASI Group.
 - b. Bobrick Washroom Equipment, Inc.
 - c. Bradley Corporation.
 - 2. Description: Double-roll unit.
 - 3. Mounting: Recessed.

- 4. Material and Finish: See plumbing accessory schedule
- 5. Lockset: Tumbler type.
- 6. Refill Indicator: Pierced slots at front.
- C. Waste Receptacle and Paper Towel Dispenser:
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. American Specialties, Inc.; ASI Group.
 - b. Bobrick Washroom Equipment, Inc.
 - c. Bradley Corporation.
 - 2. Mounting: Open top, recessed .
 - 3. Minimum Capacity: <4.9 gal.>.
 - 4. Material and Finish: See plumbing accessory schedule
 - 5. Liner: Molded Plastic trash liner holder to retain liner inside receptacle.
 - 6. Lockset: Tumbler type for waste receptacle.
- D. Liquid-Soap Dispenser:
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. American Specialties, Inc.; ASI Group.
 - b. Bobrick Washroom Equipment, Inc.
 - c. Bradley Corporation.
 - 2. Description: Designed for dispensing antibacterial soap in liquid or lotion form.
 - 3. Mounting: Vertically oriented, recessed mounted.
 - 4. Capacity: 40 oz.
 - 5. Materials: stainless steel.
 - 6. Lockset: Tumbler type.
 - 7. Refill Indicator: Window type.
- E. Grab Bar:
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. A&J Washroom Accessories, Inc.
 - b. American Specialties, Inc.; ASI Group.
 - c. Bobrick Washroom Equipment, Inc.
 - d. Bradley Corporation.
 - e. Brey-Krause Manufacturing Co.
 - f. GAMCO Specialty Accessories; a division of Bobrick.
 - g. Tubular Specialties Manufacturing, Inc.
 - 2. Mounting: Flanges with concealed fasteners.
 - 3. Material: Stainless steel, 18 GA. 1.2mm thick.
 - a. Finish: Smooth, No. 4 finish (satin) on ends and slip-resistant texture in grip area.
 - 4. Outside Diameter: 1-1/4 inches to 1-1/2 inches.

- 5. Configuration and Length: As indicated on Drawings.
- F. Mirror Unit:
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. American Specialties, Inc.; ASI Group.
 - b. Bobrick Washroom Equipment, Inc.
 - c. Bradley Corporation.
 - 2. Frame: Stainless-steel channel.
 - a. Corners: Manufacturer's standard.
 - 3. Size: As indicated on Drawings.
- G. Coat Hook:
 - 1. Basis-of-Design Product: provide product indicated on Drawings or comparable product by one of the following:
 - a. American Specialties, Inc.; ASI Group.
 - b. Bobrick Washroom Equipment, Inc.
 - c. Bradley Corporation.
 - 2. Description: Single-prong unit.
 - 3. Material and Finish: Stainless steel, No. 4 finish (satin).
- H. Shower Curtain Rod:
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. American Specialties, Inc.; ASI Group.
 - b. Bobrick Washroom Equipment, Inc.
 - c. Ginger by Brasstech, Inc.; a Masco company.
 - 2. Outside Diameter: 1 inch (25.4 mm).
 - 3. Mounting: Flanges with concealed fasteners.
- 2.4 Rod Material and Finish: See plumbing accessory schedulePRIVATE-USE BATHROOM ACCESSORIES
- 2.5 Source Limitations: Obtain private-use bathroom accessories from single source from single manufacturer.
 - A. Toilet Tissue Dispenser:
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. American Specialties, Inc.; ASI Group.

- b. Bobrick Washroom Equipment, Inc.
- c. Bradley Corporation.
- d. American Standard
- 2. Description: Single -roll dispenser.
- 3. Mounting: Surface mounted.
- 4. Capacity: Designed for 4-1/2- or 5-inch- diameter tissue rolls.
- 5. Material and Finish: matte black finish.
- B. Shower Curtain Rod:
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. American Specialties, Inc.; ASI Group.
 - b. Bobrick Washroom Equipment, Inc.
 - c. American Standard
 - 2. Outside Diameter: 1 inch.
 - 3. Mounting: Flanges with concealed fasteners.
 - 4. Rod Material and Finish: Solid brass, matte black finish.
 - 5. Flange Material and Finish: Solid brass, matte black finish.
- C. Towel Bar:
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. American Specialties, Inc.; ASI Group.
 - b. Bobrick Washroom Equipment, Inc.
 - c. American Standard
 - 2. Description: 5/8-inch- round tube with circular end brackets.
 - 3. Mounting: Flanges with concealed fasteners.
 - 4. Length: See drawings18 inches .
 - 5. Material and Finish: See plumbing accessory schedule

2.6 UNDERLAVATORY GUARDS

- A. Underlavatory Guard:
 - 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. Plumberex Specialty Products, Inc.
 - b. Truebro by IPS Corporation.
 - 2. Description: Insulating pipe covering for supply and drain piping assemblies that prevents direct contact with and burns from piping; allow service access without removing coverings.
 - 3. Material and Finish: Antimicrobial, molded plastic, white.

TOILET, BATH, AND LAUNDRY ACCESSORIES

2.7 CUSTODIAL ACCESSORIES

- A. Source Limitations: Obtain custodial accessories from single source from single manufacturer.
- B. Utility Shelf:
 - 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. A&J Washroom Accessories, Inc.
 - b. American Specialties, Inc.; ASI Group.
 - c. Bobrick Washroom Equipment, Inc.
 - d. Bradley Corporation.
 - e. Brey-Krause Manufacturing Co.
 - f. GAMCO Specialty Accessories; a division of Bobrick.
 - g. Tubular Specialties Manufacturing, Inc.
 - 2. Description: With exposed edges turned down not less than 1/2 inch and supported by two triangular brackets welded to shelf underside.
 - 3. Size: 16 inches long by 6 inches deep.
 - 4. Material and Finish: Not less than nominal 0.05-inch- thick stainless steel, No. 4 finish (satin).
- C. Mop and Broom Holder:
 - 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. A&J Washroom Accessories, Inc.
 - b. American Specialties, Inc.; ASI Group.
 - c. Bobrick Washroom Equipment, Inc.
 - d. Bradley Corporation.
 - e. Brey-Krause Manufacturing Co.
 - f. GAMCO Specialty Accessories; a division of Bobrick.
 - g. Tubular Specialties Manufacturing, Inc.
 - 2. Description: Unit with shelf, hooks, holders, and rod suspended beneath shelf.
 - 3. Length: 36 inches.
 - 4. Hooks: Four.
 - 5. Mop/Broom Holders: Three, spring-loaded, .
 - 6. Material and Finish: Stainless steel, No. 4 finish (satin).
 - a. Shelf: Not less than nominal 0.05-inch- thick stainless steel.
 - b. Rod: Approximately 1/4-inch- diameter stainless steel.

2.8 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch minimum nominal thickness unless otherwise indicated.
- B. Brass: ASTM B 19, flat products; ASTM B 16/B 16M, rods, shapes, forgings, and flat products with finished edges; or ASTM B 30, castings.
- C. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.036-inch minimum nominal thickness.
- D. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 hot-dip zinc coating.
- E. Galvanized-Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.
- F. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.
- G. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).
- H. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

2.9 FABRICATION

- A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.
- B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to ASTM F 446.

3.2 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.
- B. Remove temporary labels and protective coatings.
- C. Clean and polish exposed surfaces according to manufacturer's written instructions.

END OF SECTION 102800

SECTION 105500.13 - USPS-DELIVERY 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.
 - 2. Collection boxes.
- B. Related Requirements:
 - 1. Section 087100 "Door Hardware" Section 087111 "Door Hardware (Descriptive Specification)" for lock cylinders for postal specialties that are keyed to building keying system and for letter slots in doors.

1.3 ACTION SUBMITTALS

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

A. Product Certificates: For each type of postal specialty required to comply with USPS regulations, signed by product manufacturer. Include written approval by Postmaster General.

B. If special approval is required from the Postmaster General for selected equipment, obtain approval before installation of equipment.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For postal specialties and finishes 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. Key Blanks: 3 for every 1 lock for each type of compartment-door lock installed.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Furnish lock keys according to USPS requirements; with temporary identification for their respective locks, bagged, and securely taped inside the collection compartment for shipping.

1.8 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.
 - 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 Mail Receptacles : Consisting of multiple compartments with fixed, solid compartment backs, enclosed within a 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. Comply with USPS-STD-4C.

- 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Florence Corporation; a Gibraltar Industries company.
- 2. Front-Loading Master Door: Fabricated from extruded aluminum and braced and framed to hold compartment doors; prepared to receive master-door lock.
 - a. Master-Door Lock: Door prepared to receive lock provided by local postmaster.
- 3. Compartments: As indicated on Drawings.
- 4. Compartment Doors: Fabricated from extruded aluminum. Equip each with lock and tenant identification as required by USPS-STD-4C. Provide mail slot in the compartment with master-door lock.
 - a. 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.
- 5. Frames: Fabricated from extruded aluminum or aluminum sheet; ganged and nested units, with cardholder and blank cards for tenant's identification within each compartment.
- 6. Concealed Components and Mounting Frames: Aluminum or steel sheet with manufacturer's standard finish.
- 7. Exposed Aluminum Finish: Finish surfaces exposed to view as follows:
 - a. Baked-Enamel or Powder-Coated Finish: Color selected by Architect from manufacturers standard list of finishes.

2.2 COLLECTION BOXES

A. Front-Loading Collection Boxes Integral to Mail receptacles : Consisting of single compartment with fire-resistant cushion bottom, enclosed within wall box, with mail slot to receive mail. Provide door for collecting mail from front of unit.

2.3 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 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.

2.4 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 before 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 postal specialties level and plumb, according to manufacturer's written instructions.

USPS-DELIVERY POSTAL SPECIALTIES

- 1. Where dissimilar metals contact each other, protect against galvanic action by painting contact surfaces with bituminous coating or by applying other permanent separation as recommended by manufacturer.
- 2. Where aluminum contacts grout, concrete, masonry, or wood, protect against corrosion by painting contact surfaces with bituminous coating.
- 3. Final acceptance of postal specialties served by the USPS depends on compliance with USPS requirements.
- B. Mail Receptacles: Install mail receptacles with center of tenant-door lock cylinders and bottom of compartments at the maximum and minimum heights above finished floor established by the USPS and manufacturer's written instructions.
 - 1. Install removable-core and keyed-in door lock cylinders as required for each type of cylinder lock.

3.3 FIELD QUALITY CONTROL

A. Arrange for USPS personnel to examine and test postal specialties served by the USPS after they have been installed according to USPS regulations.

3.4 ADJUSTING AND CLEANING

- 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 105500.13

SECTION 113013 - 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:
 - 1. Cooking appliances.
 - 2. Refrigeration appliances.
 - 3. Cleaning appliances.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include installation details, material descriptions, dimensions of individual components, and finishes for each appliance.
- B. Product Schedule: For appliances. [Use same designations indicated on Drawings.]

1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of appliance.
- B. Sample Warranties: For manufacturers' special warranties.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Maintains, within <50> miles of Project site, a service center capable of providing training, parts, and emergency maintenance repairs.

1.6 WARRANTY

A. Special Warranties: Manufacturer agrees to repair or replace residential appliances or components that fail in materials or workmanship within specified warranty period.

- B. Electric Cooktop: Limited warranty, including parts and labor for first year and parts thereafter, for on-site service on surface-burner elements.
- C. Microwave Oven: Limited warranty, including parts and labor for first year and parts thereafter, for on-site service on the magnetron tube Insert requirement.
- D. [Refrigerator/Freezer] [Freezer] [Icemaker], Sealed System: Limited warranty, including parts and labor for first year and parts thereafter, for on-site service on the product.
- E. Dishwasher: Limited warranty, including parts and labor for first year and parts thereafter, for on-site service on the product.
- F. Clothes Washer: Limited warranty, including parts and labor for first year and parts thereafter, for on-site service on the product.

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. Gas-Fueled Appliances: Certified by a qualified testing agency for each type of gas-fueled appliance according to ANSI Z21 Series standards.
- C. 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] <Insert requirement>.

2.2 RANGES

- A. Electric Range [RG#] <Insert drawing designation>: Slide-in range with one oven(s) and complying with AHAM ER-1.
 - 1. Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. KitchenAid; a division of Whirlpool Corporation.
 - 2. Width: [30 inches] [36 inches] <Insert dimension>.
 - 3. Electric Burner Elements: [Four] [Six] <Insert number>.

- a. Coil Type: [Manufacturer's standard] [Two 1200 W and two 2200 W] [One 1200 W, one 2200-W dual element, and two 2200 W] <Insert burner combination and power ratings>.
- b. Radiant Type: [Two 1500 W and two 2000 W] [One 1200-W element, dual 1500-W/1500-W bridge element, and one 1200-W/2500-W expandable element] <Insert burner combination and power ratings>.
- c. Induction Type: [Manufacturer's standard] [Two 1200 W and two 1800 W] [One 1200 W, one 1800 W, one 2700 W, and one 3300 W] <Insert burner combination and power ratings>.
- d. Controls: Digital panel controls, located on [front] [left side] [right side] [splash panel at rear of rangetop].
- e. <Insert feature>.
- 4. Oven Features:
 - a. Capacity: [3.3 cu. ft.] [and] < Insert capacity for each oven >.
 - b. Operation: [Baking] [convection] [and] [pyrolytic self-cleaning or catalytic continuous cleaning] <Insert requirement>.
 - c. Broiler: Located in [top of oven] [separate roll-out drawer on bottom].
 - d. Oven Door(s): Counterbalanced, removable, with [observation window] [and] [full-width] < Insert type of handle> handle.
 - e. Electric Power Rating:
 - 1) Oven(s): [Manufacturer's standard] [2400 W] [and] <Insert power rating for each oven>.
 - 2) Broiler: [Manufacturer's standard] [3500 W] <Insert power rating>.
 - f. Controls: Digital panel controls and timer display, located on [front] [left side] [right side] [splash panel at rear of rangetop].
 - g. <Insert feature>.
- 5. Anti-Tip Device: Manufacturer's standard.
- 6. Electric Power Supply: [240 V, 60 Hz, 1 phase, 30 A] [As indicated on Drawings] </br><lnsert requirement>.
- 7. Material: [Porcelain-enameled] [Stainless] steel with [manufacturer's standard] [ceramic-glass] <Insert material> cooktop.
 - a. Color/Finish: [White] [Black] <Insert color or finish>.
- B. Dual Fuel Range [RG #] <Insert drawing designation>: [Freestanding] [Slide-in] range with gas burners and [one] [two] electric oven(s).

2.3 DISHWASHERS

A. Dishwasher [DW #] <Insert drawing designation>: Complying with AHAM DW-1.

- 1. Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. KitchenAid; a division of Whirlpool Corporation.
- 2. Type: [Built-in undercounter] [Built-in under sink] [Portable] <Insert type>.
- 3. Dimensions:
 - a. Width: [18 inches] [24 inches] [As indicated on Drawings] <Insert dimension>.
 - b. Depth: [23 inches] [25-3/4 inches] [As indicated on Drawings] <Insert dimension>.
 - c. Height: [34-1/2 inches] [As indicated on Drawings] <Insert dimension>.
- 4. Capacity:
 - a. International Place Settings of China: [Eight] [12] [14] < Insert number>.
 - b. Water Consumption for Full Load: [3.2 gal.] < Insert value> per cycle.
- 5. Sound Level: Maximum [42] [48] <Insert number> dB.
- 6. Tub and Door Liner: [Manufacturer's standard] [Porcelain-enameled steel] [Stainless steel] [Porcelain-enameled steel tub and molded-plastic door liner] <Insert requirement> with sealed detergent and automatic rinsing-aid dispensers.
- 7. Rack System: [Nylon] [PVC]-coated sliding dish racks, with [removable cutlery basket] [top cutlery tray] <Insert feature>.
- 8. Controls: [Touch-pad] [Rotary-dial] <Insert description> controls with [four] <Insert number> wash cycles and hot-air and heat-off drying cycle options.
- 9. Features:
 - a. Waste food disposer.
 - b. Self-cleaning food-filter system.
 - c. Hot-water booster heater for [140 deg F] [160 deg F] wash water with incoming water at 100 deg F.
 - d. Lock-out feature.
 - e. Half-load option.
 - f. Delay-wash option.
 - g. Digital display panel.
 - h. Water softener.
 - i. Soil-sensing water use control system.
 - j. <Insert feature>.
- 10. ENERGY STAR: Provide appliances that qualify for the EPA/DOE ENERGY STAR product-labeling program.
- 11. Front Panel: [Manufacturer's standard] [Wood panel to match kitchen cabinets] [Porcelain enamel] [Stainless steel] [Wood-panel insert specified in Section 064113 "Wood-Veneer-Faced Architectural Cabinets" to match kitchen cabinets] [Wood-panel insert specified in Section 123530 "Residential Casework" to match kitchen cabinets] [Reversible panel with choice of colors] <Insert description>.

- a. Panel Color: [White] [Black] <Insert color(s)>.
- 12. Appliance Color/Finish: [White] [Black] [Stainless steel] < Insert color or finish>.

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. Examine walls, ceilings, and roofs for suitable conditions where [overhead exhaust hoods] [downdraft exhaust] [and] [microwave ovens with vented exhaust fans] will be installed.
- D. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- E. 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 113013

SECTION 122113 - HORIZONTAL LOUVER BLINDS

- 1.1 QUALITY ASSURANCE
 - A. Mockups for each form of construction.

1.2 PRODUCTS

- A. Horizontal Louver Blinds, Wood Slats (All Units):
 - 1. Slat Width: 2 inches .
 - 2. Operating Mechanisms: Manual.
 - 3. Tilt: Full.
 - 4. Valance.
 - 5. Mounting: Overhead.
 - 6. Color: White (provide sample)
- B. Installation: Between (inside) jamb.
- 1.3 DEMONSTRATION
 - A. Factory-authorized service representative to provide training services for adjusting, operating, and maintaining motorized systems.

END OF SECTION 122113
SECTION 122413 - 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. (Location: All Public Spaces with Exterior Windows)
- B. Related Requirements:
 - 1. Section 061000 "Rough Carpentry" 061053 "Miscellaneous Rough Carpentry" for wood blocking and grounds for mounting roller shades and accessories.
 - 2. Section 079200 "Joint Sealants" for sealing the perimeters of installation accessories for light-blocking shades with a sealant.

1.3 ACTION 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.
 - 1. Motor-Operated Shades: Include details of installation and diagrams for power, signal, and control wiring.
- C. Samples: For each exposed product and for each color and texture specified, 10 inches long.
- D. Samples for Initial Selection: For each type and color of shadeband material.
 - 1. Include Samples of accessories involving color selection.
- E. Samples for Verification: For each type of roller shade.

ROLLER WINDOW SHADES

- 1. Shadeband Material: Not less than 3 inches square. Mark interior face of material if applicable.
- 2. Installation Accessories: Full-size unit, not less than 10 inches long.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: For each type of shadeband material.
- C. Product Test Reports: For each type of shadeband material, for tests performed by a qualified testing agency.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For roller shades 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. 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.

1.7 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.

1.8 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.

1.9 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 MANUALLY OPERATED SHADES WITH SINGLE ROLLERS

- A. Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide Mecho/5x System as manufactured by MechoShade Systems LLC. or comparable product by one of the following :
 - 1. Draper Inc.
 - 2. Hunter Douglas Contract.
 - 3. Lutron Electronics Co., Inc.
 - 4. MechoShade Systems, Inc.
- C. 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: Nickel-plated metal.
 - a. Loop Length: Full length of roller shade.
 - b. Limit Stops: Provide upper and lower ball stops.
 - c. Chain-Retainer Type: Chain tensioner, jamb mounted.
 - 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.

- D. Crank-and-Gear Operating Mechanisms: Sealed gearbox drive system controlled by crank handle.
 - 1. Crank-Handle Type: Permanently mounted.
 - 2. Crank-Handle Length: Manufacturer's standard.
- E. 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: Left side of interior face of shade.
 - 2. Direction of Shadeband Roll: Regular, from back (exterior face) of roller.
 - 3. Shadeband-to-Roller Attachment: Manufacturer's standard method.
- F. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.
- G. 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.
- H. Shadebands:
 - 1. Shadeband Material: Light-filtering fabric.
 - 2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
 - a. Color and Finish: As selected by Architect from manufacturer's full range.
- I. 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. Shape: L-shaped.
 - b. Height: Manufacturer's standard height required to conceal roller and shadeband assembly when shade is fully open, but not less than 4 inches
 - 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 4 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: 2 inches .
- 5. 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.
- 6. Bottom (Sill) Channel or Angle: With light seals and designed to eliminate light gaps at bottoms of shades when shades are closed.
- 7. Installation Accessories Color and Finish: As selected from manufacturer's full range.

2.2 SHADEBAND MATERIALS

- A. Shadeband Material Flame-Resistance Rating: Comply with NFPA 701. Testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- B. Light-Filtering Fabric: Woven fabric, stain and fade resistant.
 - 1. Source: Roller shade manufacturer.
 - 2. Type: Woven polyester and PVC-coated polyester.
 - 3. Weave: Basketweave.
 - 4. Openness Factor: 3 percent.
 - 5. Color: As selected by Architect from manufacturer's full range.
- C. Light-Blocking Fabric: Opaque fabric, stain and fade resistant.
 - 1. Color: As selected by Architect from manufacturer's full range.

2.3 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 .
- 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, 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.

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 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.
- B. Electrical Connections: Connect motor-operated roller shades to building electrical system.
- C. Roller Shade Locations: At exterior storefront.

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.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain motor-operated roller shades.

END OF SECTION 122413

SECTION 123530 - RESIDENTIAL 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 kitchen and vanity cabinets.
- B. Related Requirements:
 - 1. Section 123640 "Stone Countertops."
 - 2. Section 123661.16 "Solid Surfacing Countertops."

1.3 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.

1.4 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Cabinets.
 - 2. Cabinet hardware.
- 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.
 - 2. One full-size, 16 inches wide, finished base cabinet complete with hardware, doors, and drawers but without countertop. Sample will be returned to Contractor for use on Project.
- 1.5 INFORMATIONAL SUBMITTALS
 - A. Qualification Data: For manufacturer.
 - B. Product Certificates: For casework.

1.6 FIELD CONDITIONS

- 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.
- B. 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.
- C. 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.

1.7 COORDINATION

- A. Coordinate layout and installation of blocking and reinforcement in partitions for support of casework.
- PART 2 PRODUCTS
- 2.1 CABINETS
 - A. Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- B. Basis-of-Design Product: Subject to compliance with requirements, provide Republic Elite or comparable product by one of the following:
 - 1. Armstrong Cabinet.
 - 2. Leedo Cabinetry.
 - 3. Merillat Industries, Inc.
 - 4. Republic Industries.
 - 5. Smart Cabinetry LLC.
- C. Quality Standard: Provide cabinets that comply with KCMA A161.1.
 - 1. KCMA Certification: Provide cabinets with KCMA's "Certified Cabinet" seal affixed in a semiexposed location of each unit and showing compliance with the above standard.
- D. Face Style: Flush overlay; door and drawer faces cover cabinet fronts with only enough space between faces for operating clearance.
- E. Door and Drawer Fronts: 3/4-inch- thick, veneer-faced plywood.
- F. Face Frames: 3/4-by-1-5/8-inch solid wood with glued mortise and tenon or doweled joints.
- G. Exposed Cabinet End Finish: Wood veneer .
- H. Cabinet Tops and Bottoms: 5/8-inch- 1/2-inch- thick particleboard or 1/2-inch-3/8-inch- thick plywood, fully supported by and secured in rabbets in end panels, front frame, and back rail.
- I. 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.
- J. Wall-Hung-Unit Back Panels: 3/16-inch- thick plywood fastened to rear edge of end panels and to top and bottom rails.
- K. Base-Unit Back Panels: 3/16-inch- thick plywood fastened to rear edge of end panels and to top and bottom rails.
- L. Front Frame Drawer Rails: 3/4-by-1-1/4-inch solid wood mortised and fastened into face frame.
- M. Drawers: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.
 - 1. Join subfronts, backs, and sides with glued dovetail joints.
 - 2. Subfronts, Backs, and Sides: 3/4-inch- 1/2-inch- thick solid wood.
 - 3. Subfronts, Backs, and Sides: 3/8-inch- thick plywood.
 - 4. Bottoms: 1/4-inch- thick plywood.
- N. Shelves: Solid wood

- O. 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.
- P. Factory Finishing: Finish cabinets at factory. Defer only final touchup until after installation.

2.2 CABINET MATERIALS

- A. Hardwood Lumber: Kiln dried to 7 percent moisture content.
- B. Softwood Lumber: Kiln dried to 10 percent moisture content.
- C. Composite Wood Products: Products shall be made using ultra-low-emitting formaldehyde resins as defined in the California Air Resources Board's "Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products" or shall be made with no added formaldehyde.
- D. Hardwood Plywood: HPVA HP-1.
- E. Particleboard: ANSI A208.1, Grade M-2.
 - 1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- 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.
 - 1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25> percent.
- H. Hardboard: ANSI A135.4, Class 1 Tempered.
- I. Adhesives: Use adhesives that meet 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."
- J. Exposed Materials:
 - 1. Exposed Wood Species: As shown on drawings.
 - a. Select materials for compatible color and grain. Do not use two adjacent exposed surfaces that are noticeably dissimilar in color, grain, figure, or natural character markings.
 - b. Staining and Finish: As selected by Architect from manufacturer's full range.

- 2. Solid Wood: Clear hardwood lumber of species indicated, free of defects.
- 3. Plywood: Hardwood plywood with face veneer of species indicated, with Grade A faces and Grade C backs of same species as faces.
 - a. Edge band exposed edges with veneer edging of same species as face veneer.
- K. Semiexposed Materials: Unless otherwise indicated, provide the following:
 - 1. Solid Wood: Sound hardwood lumber, selected to eliminate appearance defects. Same species as exposed surfaces or stained to be compatible with exposed surfaces.
- L. Concealed Materials: Solid wood or plywood, of any hardwood or softwood species, with no defects affecting strength or utility; particleboard; MDF; or hardboard.

2.3 CABINET HARDWARE

- A. General: Manufacturer's standard units complying with BHMA A156.9, of type, size, style, material, and finish matching Architect's sample.
- B. Pulls: See drawings for specifications.
- C. Hinges: Concealed European style, self-closing 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.

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 INSTALLATION

- A. Install cabinets with no variations in flushness of adjoining surfaces; use concealed shims. Where cabinets abut other finished work, scribe and cut for accurate fit. Provide filler strips, scribe strips, and moldings in finish to match cabinet face.
- B. Install cabinets without distortion so doors and drawers fit the openings, are aligned, and are uniformly spaced. Complete installation of hardware and accessories as indicated.

- C. Install cabinets level and plumb to a tolerance of 1/8 inch in 8 feet.
- D. Fasten cabinets to adjacent units and to backing.
 - 1. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches o.c. with No. 10 wafer-head screws sized for not less than 1-1/2-inch penetration into wood framing, blocking, or hanging strips.

3.3 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 123530

SECTION 123640 - STONE 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 stone countertops.
- B. Related Requirements:
 - 1. Section 123530 Residential Casework.

1.3 ACTION SUBMITTALS

- A. Product Data: For each variety of stone, stone accessory and manufactured product.
- B. Shop Drawings:
 - 1. Include plans, sections, details, and attachments to other work.
 - 2. Show locations and details of joints.
 - 3. Show direction of veining, grain, or other directional pattern.
- C. Samples for Verification: For each stone type indicated, in sets of Samples not less than 12 inches square.
 - 1. Include three or more Samples in each set and show the full range of variations in appearance characteristics expected in the completed Work.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.
- B. Material Test Reports:
 - 1. Stone Test Reports: For each stone variety proposed for use on Project, by a qualified testing agency, indicating compliance with required physical properties, according to referenced ASTM standards. Base reports on testing done within previous five years.
 - 2. Sealant Compatibility and Adhesion Test Report: From sealant manufacturer indicating that sealants will not stain or damage stone.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For stone countertops to include in maintenance manuals. Include product data for stone-care products used or recommended by Installer, and names, addresses, and telephone numbers of local sources for products.

1.6 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate stone countertops similar to that required for this Project, and whose products have a record of successful in-service performance.
- B. Installer Qualifications: Fabricator of stone countertops.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store and handle stone and related materials to prevent deterioration or damage due to moisture, temperature changes, contaminants, corrosion, breaking, chipping, and other causes.
 - 1. Lift stone with wide-belt slings; do not use wire rope or ropes that might cause staining. Move stone, if required, using dollies with cushioned wood supports.
 - 2. Store stone on wood A-frames or pallets with nonstaining, waterproof covers. Arrange to distribute weight evenly and to prevent damage to stone. Ventilate under covers to prevent condensation.

1.8 FIELD CONDITIONS

A. Field Measurements: Verify dimensions of construction to receive stone countertops by field measurements before fabrication and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations for Stone: Obtain each variety of stone, regardless of finish, from a single quarry, whether specified in this Section or in another Specification Section, with resources to provide materials of consistent quality in appearance and physical properties.
 - 1. For stone types that include same list of varieties and sources, provide same variety from same source for each.
 - 2. Make stone slabs available for examination by Architect.

- a. Architect will select aesthetically acceptable slabs and will indicate aesthetically unacceptable portions of slabs.
- b. Segregate slabs selected for use on Project and mark backs indicating approval.
- c. Mark and photograph aesthetically unacceptable portions of slabs as directed by Architect.

2.2 GRANITE

A. Material Standard: Comply with ASTM C 615/C 615M.

VMarva Marble Co. - Brazilian Luna Pearl White Granite

- B. Cut stone from contiguous, matched slabs in which natural markings occur.
- C. Finish: As indicated.
 - 1. Varieties and Sources: Subject to compliance with requirements, provide the following:

2.3 QUARTZ

- A. Material Standards:
 - 1. Maximum Absorption per ASTM C 97/C 97M: <Insert value>.
 - 2. Minimum Compressive Strength per ASTM C 170/C 170M: <Insert value>.
 - 3. Minimum Flexural Strength per ASTM C 880/C 880M: <Insert value>.
 - 4. Minimum Stone Abrasion Resistance per ASTM C 241/C 241M or ASTM C 1353/C 1353M: 10.
- B. Varieties and Sources: Subject to compliance with requirements, provide the following:
 - 1. As shown on drawings.
- C. Finish: As shown on drawings.

Thickness: 3cm

- 2.4 ADHESIVES, GROUT, SEALANTS, AND STONE ACCESSORIES
 - A. General: Use only adhesives formulated for stone and ceramic tile and that are recommended by their manufacturer for the application indicated.
 - B. Water-Cleanable Epoxy Adhesive: ANSI A118.3.

STONE COUNTERTOPS

- C. Water-Cleanable Epoxy Grout: ANSI A118.3, chemical-resistant, water-cleanable, tile-setting and -grouting epoxy.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Bostik, Inc.
 - b. Custom Building Products.
 - c. MAPEI Corporation.
- D. Sealant for Countertops: Manufacturer's standard sealant that complies with applicable requirements in Section 079200 "Joint Sealants" and that will not stain the stone it is applied to.
 - 1. Mildew-Resistant Joint Sealant: Mildew resistant, single component, nonsag, neutral curing, silicone.
 - 2. Color: As selected by Architect from manufacturer's full range.
- E. Stone Joint Splines: Stainless-steel or brass washers approximately 1 inch in diameter and of thickness to fit snugly in saw-cut kerf in edge of stone units.
- F. Stone Cleaner: Specifically formulated for stone types, finishes, and applications indicated, as recommended by stone producer. Do not use cleaning compounds containing acids, caustics, harsh fillers, or abrasives.
- G. Stone Sealer: Colorless, stain-resistant sealer that does not affect color or physical properties of stone surfaces, as recommended by stone producer for application indicated.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Bostik, Inc.
 - b. Hillyard, Inc.
 - c. HMK Stone Care System; ACI International.
 - d. Stone Care International Inc.

2.5 STONE FABRICATION, GENERAL

- A. Select stone for intended use to prevent fabricated units from containing cracks, seams, and starts that may impair structural integrity, function, or appearance.
 - 1. Repairs that are characteristic of the varieties specified are acceptable provided they do not impair structural integrity or function and are not aesthetically unpleasing, as judged by Architect.
- B. Grade and mark stone for final locations to produce assembled countertop units with an overall uniform appearance.

- C. Fabricate stone countertops in sizes and shapes required to comply with requirements indicated.
 - 1. Clean sawed backs of stones to remove rust stains and iron particles.
 - 2. Dress joints straight and at right angle to face unless otherwise indicated.
 - 3. Cut and drill sinkages and holes in stone for anchors, supports, and attachments.
 - 4. Provide openings, reveals, and similar features as needed to accommodate adjacent work.
 - 5. Fabricate molded edges with machines having abrasive shaping wheels made to reverse contour of edge profile to produce uniform shape throughout entire length of edge and with precisely formed arris slightly eased to prevent snipping, and matched at joints between units. Form corners of molded edges as indicated with outside corners slightly eased unless otherwise indicated.
 - Finish exposed faces of stone to comply with requirements indicated for finish of each stone type required and to match approved Samples and mockups. Provide matching finish on exposed edges of countertops, splashes, and cutouts.
- D. Carefully inspect finished stone units at fabrication plant for compliance with requirements for appearance, material, and fabrication. Replace defective units.

2.6 STONE COUNTERTOPS

- A. General: Comply with recommendations in MIA's "Dimension Stone Design Manual VII."
- B. Nominal Thickness: Provide thickness indicated, but not less than 3/4 inch. Gage backs to provide units of identical thickness.
- C. Edge Detail: Straight, slightly eased at top.
- D. Splashes: Provide 3/4-inch- thick backsplashes and end splashes as indicated on drawings.
 - 1. Height: 4 inches.
 - 2. Top-Edge Detail: Straight, slightly eased at corner.
- E. Joints: Fabricate countertops in sections for joining in field.
 - 1. Joint Locations: Not within 18 inches of a sink or cooktop and not where a countertop section less than 36 inches long may result, unless unavoidable.
 - 2. Joint Type: Bonded, 1/32 inch or less in width.
- F. Cutouts and Holes:
 - 1. Undercounter Fixtures: Make cutouts for undercounter fixtures in shop 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.
- 2. Counter-Mounted 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.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates to receive stone countertops and conditions under which stone countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of stone countertops.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of stone countertops.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Advise installers of other work about specific requirements for placement of inserts and similar items to be used by stone countertop Installer for anchoring stone countertops. Furnish installers of other work with Drawings or templates showing locations of these items.
- B. Before installing stone countertops, clean dirty or stained stone surfaces by removing soil, stains, and foreign materials. Use only mild cleaning compounds that contain no caustic or harsh materials or abrasives and rinse with clear water. Allow stone to dry before installing.

3.3 CONSTRUCTION TOLERANCES

- A. Variation from Level: Do not exceed 1/8 inch in 96 inches, 1/4 inch maximum.
- B. Variation in Joint Width: Do not vary joint thickness more than one-fourth of nominal joint width.
- C. Variation in Plane at Joints (Lipping): Do not exceed 1/64-inch difference between planes of adjacent units.

D. Variation in Line of Edge at Joints (Lipping): Do not exceed 1/64-inch difference between edges of adjacent units, where edge line continues across joint.

3.4 INSTALLATION OF COUNTERTOPS

- A. Fasten subtops to cabinets by screwing through subtops into cornerblocks of base cabinets. Shim as needed to align subtops in a level plane.
- B. Install countertops over subtops with full spread of water-cleanable epoxy adhesive.
- C. Install countertops by adhering to supports with water-cleanable epoxy adhesive.
- D. Do not cut stone in field unless otherwise indicated. If stone countertops or splashes require additional fabrication not specified to be performed at Project site, return to fabrication shop for adjustment.
- E. Do necessary field cutting as stone is set. Use power saws with diamond blades to cut stone. Cut lines straight, true, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.
- F. Set stone to comply with requirements indicated. Shim and adjust stone to locations indicated, with uniform joints of widths indicated and with edges and faces aligned according to established relationships and indicated tolerances. Install anchors and other attachments indicated or necessary to secure stone countertops in place.
- G. Bond joints with stone 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 stone edges at joints where indicated. Fill kerfs with stone 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.
- H. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Use power saws with diamond blades to cut stone. 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.
- I. Install backsplashes and end splashes by adhering to wall with water-cleanable epoxy adhesive. Leave 1/16-inch gap between countertop and splashes for filling with sealant. Use temporary shims to ensure uniform spacing.
- J. Grout joints to comply with ANSI A108.10. Remove temporary shims before grouting. Tool grout uniformly and smoothly with plastic tool.
- K. Apply sealant to joints and; comply with Section 079200 "Joint Sealants." Remove temporary shims before applying sealant.

3.5 ADJUSTING AND CLEANING

- A. In-Progress Cleaning: Clean countertops as work progresses. Remove adhesive, grout, mortar, and sealant smears immediately.
- B. Remove and replace stone countertops of the following description:
 - 1. Broken, chipped, stained, or otherwise damaged stone. Stone may be repaired if methods and results are approved by Architect.
 - 2. Defective countertops.
 - 3. Defective joints, including misaligned joints.
 - 4. Interior stone countertops and joints not matching approved Samples and mockups.
 - 5. Interior stone countertops not complying with other requirements indicated.
- C. Replace in a manner that results in stone countertops matching approved Samples and mockups, complying with other requirements, and showing no evidence of replacement.
- D. Clean stone countertops no fewer than six days after completion of installation, using clean water and soft rags. Do not use wire brushes, acid-type cleaning agents, cleaning compounds with caustic or harsh fillers, or other materials or methods that may damage stone.
- E. Sealer Application: Apply stone sealer to comply with stone producer's and sealer manufacturer's written instructions.

END OF SECTION 123640

?

SECTION 129313 - BICYCLE RACKS AND LOCKERS GENERAL

1.1 SECTION INCLUDES

- A. Bicycle racks of the following types:
 - 1. Bike Hitch.
 - 2. Hoop Rack.
 - 3. Hoop Rack Heavy Duty.
 - 4. Swerve Rack.
 - 5. Downtown Rack.
 - 6. Round Rack.
 - 7. Arc Rack.
 - 8. Cycle Dock.
 - 9. Bike Bike Rack.
 - 10. Campus Rack.
 - 11. Ultra Space Saver.
 - 12. Ultra Space Saver Squared.
 - 13. Ultra Space Saver Single.
 - 14. Bike File.
 - 15. Dero Decker.
 - 16. Dero Duplex.
 - 17. Alley Rack.
 - 18. Switchback.
 - 19. Wall Rack.
- B. Bicycle accessories of the following types:
 - 1. Fixit.
 - 2. Air Kit 2.
 - 3. Air Kit 3.
- C. Bicycle shelters of the following types:
 - 1. Kolo Shelter.
 - 2. Cycle Station.
 - 3. Vizor Shelter.
 - 4. Bike Haven.
 - 5. Pocket Shelter.
- D. Bicycle lockers of the following types:
 - 1. Dero Locker.
 - 2. Veloport.
- E. Bicycle parking system:
 - 1. Cycle Stall Basic.

1.2 RELATED SECTIONS

- A. Section 312000 Earth Moving.
- B. Section 334000 Storm Drainage Utilities.
- C. Section 129343.53 Site Tables.
- D. Section 033000 Cast-in-Place Concrete.

1.3 SUBMITTALS

- A. Submit under provisions of Section 013000 Administrative Requirements.
- B. Product Data: Manufacturer's product literature and technical data, including physical characteristics such as shape, dimensions, bicycle parking capacity, and finish for each product.
- C. Shop Drawings; Show installation details for each product.
- D. Maintenance Data: For each bicycle rack. Include recommended methods for repairing damage to the finish

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Minimum 2 years manufacturing similar products.
- B. Installer Qualifications: An experienced installer who has completed installation of products similar in material, design, and extent to that indicated for this project.
- C. Source Limitations: Obtain each color, finish, shape and type of product from a single source with resources to provide components of consistent quality in appearance and physical properties.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Comply with manufacturer's recommendations.
- B. Store products in original undamaged packages and containers until ready for installation.

1.6 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 recommended limits.

1.7 WARRANTY

A. Provide manufacturer's standard limited warranty against defects in materials and workmanship.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: Dero Bike Rack Co., which is located at: 5522 Lakeland Ave. N.; Minneapolis, MN 55429; Toll Free Tel: 888-337-6729; Tel: 612-359-0689; Fax: 612-331-2731; Email: request info (sales@dero.com); Web: http://www.dero.com
- B. Substitutions: Not permitted.
- C. Requests for substitutions will be considered in accordance with provisions of Section 016000 Product Requirements.

2.2 BICYCLE RACKS

- A. Bike Hitch:
 - 1. Capacity: 2 bicycles.
 - 2. Center Beam: 2 inch diameter schedule 40 pipe.
 - 3. Ring: 1-1/2 inch O.D. 11 gauge tube.
 - 4. Logo: Custom logo, design to be provided by Architect.
 - 5. Logo: ____
 - 6. Logo: Custom logo as indicated on Drawings.
 - 7. Mounting: Surface-mounted.
 - 8. Mounting: In-ground mounted.
 - 9. Finish: Hot-dip galvanized.
 - 10. Finish: Stainless steel, 304 grade, with No. 4 finish and Spectra Shield.
 - 11. Finish: Stainless steel, 304 grade, with high luster electropolish finish and Spectra Shield.
 - 12. Finish: PVC dip.
 - 13. Finish: Powder coated.
 - a. Epoxy primer.
 - b. UV resistant polyester powder coat.
 - c. Minimum thickness: 6 mils.
 - d. Color: To be selected by Architect.
 - e. Color: ____
 - f. Color: As indicated on Drawings.
 - 14. Finish: Thermoplastic.
 - a. Color: To be selected by Architect.
 - b. Color: _____

- c. Color: As indicated on Drawings.
- B. Hoop Rack:
 - 1. Capacity: 2 bicycles.
 - 2. Pipe: 1-1/2 inch schedule 40 pipe, 1.90 inch O.D.
 - 3. Logo: Custom logo, design to be provided by Architect.
 - 4. Logo: ____
 - 5. Logo: Custom logo as indicated on Drawings.
 - 6. Mounting: Surface-mounted.
 - 7. Mounting: In-ground mounted.
 - 8. Mounting: Rail rack: Hoops to be bolted to two parallel rails.
 - a. Rail Material: AISI C3 x 4.1 steel channels.
 - 9. Finish: Hot-dip galvanized.
 - 10. Finish: Stainless steel, 304 grade, with No. 4 finish and Spectra Shield.
 - 11. Finish: Stainless steel, 304 grade, with high luster electropolish finish and Spectra Shield.
 - 12. Finish: PVC dip.
 - 13. Finish: Powder coated.
 - a. Epoxy primer.
 - b. UV resistant polyester powder coat.
 - c. Minimum thickness: 6 mils.
 - d. Color: To be selected by Architect.
 - e. Color: _
 - f. Color: As indicated on Drawings.
 - 14. Finish: Thermoplastic.
 - a. Color: To be selected by Architect.
 - b. Color: ___
 - c. Color: As indicated on Drawings.
- C. Heavy Duty Hoop Rack:
 - 1. Capacity: 2 bicycles.
 - 2. Pipe: 2 inch schedule 40 pipe.
 - 3. Logo: Custom logo, design to be provided by Architect.
 - 4. Logo: ____
 - 5. Logo: Custom logo as indicated on Drawings.
 - 6. Mounting: Surface-mounted.
 - 7. Mounting: In-ground mounted.
 - 8. Mounting: Rail rack: Hoops to be bolted to two parallel rails.
 - a. Rail Material: AISI C3 x 4.1 steel channels.
 - 9. Finish: Hot-dip galvanized.
 - 10. Finish: Stainless steel, 304 grade, with No. 4 finish and Spectra Shield.
 - 11. Finish: Stainless steel, 304 grade, with high luster electropolish finish and Spectra Shield.
 - 12. Finish: PVC dip.

- 13. Finish: Powder coated.
 - a. Epoxy primer.
 - b. UV resistant polyester powder coat.
 - c. Minimum thickness: 6 mils.
 - d. Color: To be selected by Architect.
 - e. Color: ___
 - f. Color: As indicated on Drawings.
- 14. Finish: Thermoplastic.
 - a. Color: To be selected by Architect.
 - b. Color: ___
 - c. Color: As indicated on Drawings.
- D. Swerve Rack:
 - 1. Capacity: 2 bicycles.
 - 2. Pipe: 1-1/2 inch schedule 40 pipe, 1.90 inch O.D.
 - 3. Logo: Custom logo, design to be provided by Architect.
 - 4. Logo: ____
 - 5. Logo: Custom logo as indicated on Drawings.
 - 6. Mounting: Surface-mounted.
 - 7. Mounting: In-ground mounted.
 - 8. Mounting: Rail rack: Hoops to be bolted to two parallel rails.
 - a. Rail Material: AISI C3 x 4.1 steel channels.
 - 9. Finish: Hot-dip galvanized.
 - 10. Finish: Stainless steel, 304 grade, with No. 4 finish and Spectra Shield.
 - 11. Finish: Stainless steel, 304 grade, with high luster electropolish finish and Spectra Shield.
 - 12. Finish: PVC dip.
 - 13. Finish: Powder coated.
 - a. Epoxy primer.
 - b. UV resistant polyester powder coat.
 - c. Minimum thickness: 6 mils.
 - d. Color: To be selected by Architect.
 - e. Color: ___
 - f. Color: As indicated on Drawings.
 - 14. Finish: Thermoplastic.
 - a. Color: To be selected by Architect.
 - b. Color: _
 - c. Color: As indicated on Drawings.
- E. Downtown Rack:
 - 1. Capacity: 2 bicycles.
 - 2. Square Tube: Mild steel, 2 inch, 3/16 inch square tube.
 - 3. Square Tube: Stainless steel, 2 inch, 11 gauge square tube.

BICYCLE RACKS AND LOCKERS

- 4. Logo: Custom logo, design to be provided by Architect.
- 5. Logo: ____
- 6. Logo: Custom logo as indicated on Drawings.
- 7. Mounting: Surface-mounted.
- 8. Mounting: In-ground mounted.
- 9. Mounting: Rail rack: Hoops to be bolted to two parallel rails.
 - a. Rail Material: AISI C3 x 4.1 steel channels.
- 10. Finish: Hot-dip galvanized.
- 11. Finish: Stainless steel, 304 grade, with No. 4 finish and Spectra Shield.
- 12. Finish: Stainless steel, 304 grade, with high luster electropolish finish and Spectra Shield.
- 13. Finish: PVC dip.
- 14. Finish: Powder coated.
 - a. Epoxy primer.
 - b. UV resistant polyester powder coat.
 - c. Minimum thickness: 6 mils.
 - d. Color: To be selected by Architect.
 - e. Color: ___
 - f. Color: As indicated on Drawings.
- 15. Finish: Thermoplastic.
 - a. Color: To be selected by Architect.
 - b. Color: _
 - c. Color: As indicated on Drawings.
- F. Round Rack:
 - 1. Capacity: 2 bicycles.
 - 2. Pipe: 1-1/2 inch pipe.
 - 3. Logo: Custom logo, design to be provided by Architect.
 - 4. Logo: ____
 - 5. Logo: Custom logo as indicated on Drawings.
 - 6. Mounting: Surface-mounted.
 - 7. Mounting: In-ground mounted.
 - 8. Finish: Hot-dip galvanized.
 - 9. Finish: Stainless steel, 304 grade, with No. 4 finish and Spectra Shield.
 - 10. Finish: Stainless steel, 304 grade, with high luster electropolish finish and Spectra Shield.
 - 11. Finish: Powder coated.
 - a. Epoxy primer.
 - b. UV resistant polyester powder coat.
 - c. Minimum thickness: 6 mils.
 - d. Color: To be selected by Architect.
 - e. Color: ____
 - f. Color: As indicated on Drawings.
 - 12. Finish: Thermoplastic.

- a. Color: To be selected by Architect.
- b. Color: _
- c. Color: As indicated on Drawings.
- G. Arc Rack:
 - 1. Capacity: 2 bicycles.
 - 2. Tube: 2 inch by 11 gauge square tube.
 - 3. Logo: Custom logo, design to be provided by Architect.
 - 4. Logo: ____
 - 5. Logo: Custom logo as indicated on Drawings.
 - 6. Mounting: Surface-mounted.
 - 7. Mounting: In-ground mounted.
 - 8. Finish: Hot-dip galvanized.
 - 9. Finish: Stainless steel, 304 grade.
 - 10. Finish: Powder coated.
 - a. Epoxy primer.
 - b. UV resistant polyester powder coat.
 - c. Minimum thickness: 6 mils.
 - d. Color: To be selected by Architect.
 - e. Color: __
 - f. Color: As indicated on Drawings.
 - 11. Finish: Thermoplastic.
 - a. Color: To be selected by Architect.
 - b. Color: ____
 - c. Color: As indicated on Drawings.
- H. Cycle Dock Rack:
 - 1. Capacity: 2 bicycles.
 - 2. Rack: 5/16 inch steel body and 1/2 inch steel base.
 - 3. Mounting: Surface-mounted.
 - 4. Finish: Hot-dip galvanized.
 - 5. Finish: Stainless steel, 304 grade.
 - 6. Finish: Powder coated.
 - a. Epoxy primer.
 - b. UV resistant polyester powder coat.
 - c. Minimum thickness: 6 mils.
 - d. Color: To be selected by Architect.
 - e. Color: ___
 - f. Color: As indicated on Drawings.
 - 7. Finish: Thermoplastic.
 - a. Color: To be selected by Architect.
 - b. Color: ____
 - c. Color: As indicated on Drawings.

- I. Bike Bike Rack:
 - 1. Capacity: 2 to 4 bicycles.
 - 2. Body: 1-1/2 inch O.D. 11 gauge steel tube.
 - 3. Feet: 1/4 x 2-1/2 x 6 inch.
 - 4. Seat: 1/4 inch plate steel.
 - 5. Ends: Capped and ground smooth.
 - 6. Logo: Custom logo, design to be provided by Architect.
 - 7. Logo: ____
 - 8. Logo: Custom logo as indicated on Drawings.
 - 9. Mounting: Surface-mounted.
 - 10. Mounting: In-ground mounted.
 - 11. Finish: Hot-dip galvanized.
 - 12. Finish: Stainless steel, 304 grade, with No. 4 finish and Spectra Shield.
 - 13. Finish: Stainless steel, 304 grade, with high luster electropolish finish and Spectra Shield.
 - 14. Finish: Powder coated.
 - a. Epoxy primer.
 - b. UV resistant polyester powder coat.
 - c. Minimum thickness: 6 mils.
 - d. Color: To be selected by Architect.
 - e. Color: _
 - f. Color: As indicated on Drawings.
 - 15. Finish: Thermoplastic.
 - a. Color: To be selected by Architect.
 - b. Color: ___
 - c. Color: As indicated on Drawings.
- J. Campus Rack:
 - 1. Single Sided:
 - a. S3: 3 bicycle capacity.
 - 1) Length: 64 inches.
 - b. S4: 4 bicycle capacity.
 - 1) Length: 89 inches.
 - c. S5: 5 bicycle capacity.
 - 1) Length: 115 inches.
 - d. S6: 6 bicycle capacity.
 - 1) Length: 139 inches.
 - 2. Double Sided:

- a. D5: 5 bicycle capacity
 - 1) Length: 64 inches.
- b. D7: 7 bicycle capacity
 - 1) Length: 89 inches.
- c. D9: 9 bicycle capacity
 - 1) Length: 114 inches.
- d. D11: 11 bicycle capacity
 - 1) Length: 139 inches.
- 3. Center Beam: 3 inch O.D. 11 gauge steel tube.
- 4. Ears: 1-1/4 inch O.D. 11 gauge tube.
- 5. Feet: C3 x 1.4 x 3/16 x 24 inch channels.
- 6. Mounting: Surface-mounted.
- 7. Mounting: In-ground mounted.
- 8. Finish: Hot-dip galvanized.
- 9. Finish: Stainless steel, 304 grade, with No. 4 finish and Spectra Shield.
- 10. Finish: Stainless steel, 304 grade, with high luster electropolish finish and Spectra Shield.
- 11. Finish: Powder coated.
 - a. Epoxy primer.
 - b. UV resistant polyester powder coat.
 - c. Minimum thickness: 6 mils.
 - d. Color: To be selected by Architect.
 - e. Color: ____
 - f. Color: As indicated on Drawings.
- 12. Finish: Thermoplastic.
 - a. Color: To be selected by Architect.
 - b. Color: ___
 - c. Color: As indicated on Drawings.
- K. Ultra Space Saver Rack: Modular system, one bike per hanger.
 - 1. Single Sided:
 - a. Capacity: _____
 - 2. Double Sided:
 - a. Capacity: _____
 - 3. Hanger: 1 inch O.D. 11 gauge tube with 1/2 inch steel round bar.
 - 4. Upright: 2 x 2 x 11 gauge inch square tube.

- 5. Feet: AISI C3 x 4.1 galvanized steel chan.
- 6. Crossbeams: 1-1/4 inch schedule 40 galvanized pipe, 1.66 inch O.D.
- 7. Spacers: 2-3/8 inch O.D. plastic tubes with .218 inch wall thickness.
- 8. Mounting: Floor-mounted.
- 9. Mounting: Wall-mounted.
- 10. Finish: Hot-dip galvanized.
- 11. Finish: Powder coated.
 - a. Epoxy primer.
 - b. UV resistant polyester powder coat.
 - c. Minimum thickness: 6 mils.
 - d. Color: Black (standard).
 - e. Color: To be selected by Architect.
 - f. Color: __
 - g. Color: As indicated on Drawings.
- L. Ultra Space Saver Squared Rack: Modular system, one bike per hanger.
 - 1. Single Sided:
 - a. Capacity: _____
 - 2. Double Sided:
 - a. Capacity: _____
 - 3. Arm: 1 inch x 11 gauge square tube with 1/2 inch steel round bar.
 - 4. Upright: 2 x 2 x 11 gauge square tube.
 - 5. Feet: AISI C3 x 4.1 galvanized steel chan.
 - 6. Crossbeams: 1-1/4 inch schedule 40 galvanized pipe, 1.66 inch O.D.
 - 7. Mounting: Floor-mounted.
 - 8. Mounting: Wall-mounted.
 - 9. Finish: Hot-dip galvanized.
 - 10. Finish: Powder coated.
 - a. Epoxy primer.
 - b. UV resistant polyester powder coat.
 - c. Minimum thickness: 6 mils.
 - d. Color: Black (standard).
 - e. Color: To be selected by Architect.
 - f. Color: ___
 - g. Color: As indicated on Drawings.
- M. Ultra Space Saver Single Rack:
 - 1. Capacity: One bicycle.
 - 2. Body: 1 inch O.D. 11 gauge tube with 1/2 inch steel round bar.
 - 3. Mounting Flange: 1/4 inch plate.
 - 4. Finish: Hot-dip galvanized.
 - 5. Finish: Powder coated.
 - a. Epoxy primer.
 - b. UV resistant polyester powder coat.

- c. Minimum thickness: 6 mils.
- d. Color: Black (standard).
- e. Color: To be selected by Architect.
- f. Color: __
- g. Color: As indicated on Drawings.
- N. Bike File Rack:
 - 1. Capacity: Nine bicycles per 8 foot unit.
 - 2. Trolley Track: 12 gauge galvanized steel.
 - 3. Trolley Assembly: Steel, 1 inch 16 gauge arms.
 - 4. Mounting: Floor-mounted.
 - 5. Mounting: Wall-mounted.
 - 6. Mounting: Ceiling-mounted.
 - 7. Finish: Zinc-plated frame components and stainless steel trolleys.
- O. Dero Decker Rack: Modular system.
 - 1. Single Sided:
 - a. Capacity: 4 bicycles.
 - b. Capacity: 8 bicycles.
 - c. Capacity: 12 bicycles.
 - 2. Double Sided:
 - a. Capacity: 8 bicycles.
 - b. Capacity: 16 bicycles.
 - c. Capacity: 24 bicycles.
 - 3. Uprights: 4 inch by 12 gauge square tube.
 - 4. Upright Base: 1/4 inch plate.
 - 5. Crossbar: 4 inch by 7 gauge square tube.
 - 6. Cantilevers: 2 x 4 inch by 11 gauge tube.
 - 7. Cantilever Base: 1/4 inch plate.
 - 8. Trays: 1/8 inch plate, 1/2 inch round bar.
 - 9. Mounting: Floor-mounted.
 - 10. Finish: Hot-dip galvanized (standard).
 - 11. Finish: Stainless steel, 304 grade.
 - 12. Finish: Powder coated.
 - a. Epoxy primer.
 - b. UV resistant polyester powder coat.
 - c. Minimum thickness: 6 mils.
 - d. Color: To be selected by Architect.
 - e. Color: _
 - f. Color: As indicated on Drawings.
- P. Dero Duplex Rack: Modular system.
 - 1. Capacity:
 - 2. Main Frame: 2 inch by 11 gauge square tube.
 - 3. Connector Plates: 1/4 inch plate.

BICYCLE RACKS AND LOCKERS

- 4. Trays: 11 gauge plate.
- 5. Finish: Hot-dip galvanized (standard).
- 6. Finish: Stainless steel, 304 grade.
- 7. Finish: Powder coated.
 - a. Epoxy primer.
 - b. UV resistant polyester powder coat.
 - c. Minimum thickness: 6 mils.
 - d. Color: To be selected by Architect.
 - e. Color: __
 - f. Color: As indicated on Drawings.
- Q. Alley Rack:
 - 1. Capacity: 2 bicycles.
 - 2. Base: 5/16 inch plate.
 - 3. Arm: 5/8 inch plate.
 - 4. Hinge Pin: 1-1/2 inch schedule 40 pipe.
 - 5. Mounting: Wall-mounted.
 - 6. Finish: Hot-dip galvanized with thermoplastic coating over the arm (standard).
 - a. Color: To be selected by Architect.
 - b. Color: __
 - c. Color: As indicated on Drawings.
 - 7. Finish: Stainless steel, 304 grade.
- R. Switchback Rack:
 - 1. Capacity: 1 bicycle.
 - 2. Rack: 3 x 3/8 inch steel.
 - 3. Cable: 3/16 inch 7x19 steel cable with 1/4 inch O.D. vinyl coating.
 - 4. Mounting: Wall-mounted.
 - 5. Finish: Hot-dip galvanized (standard).
 - 6. Finish: Powder coated.
 - a. Epoxy primer.
 - b. UV resistant polyester powder coat.
 - c. Minimum thickness: 6 mils.
 - d. Color: To be selected by Architect.
 - e. Color: ___
 - f. Color: As indicated on Drawings.
 - 7. Finish: Thermoplastic.
 - a. Color: To be selected by Architect.
 - b. Color:
 - c. Color: As indicated on Drawings.
 - 8. Finish: Stainless steel, 304 grade.
- S. Wall Rack:

BICYCLE RACKS AND LOCKERS

- 1. Capacity: 2 bicycles.
- 2. Mounting: Wall-mounted.
- 3. Color: Black.

2.3 BICYCLE ACCESSORIES

- A. Fixit:
 - 1. Main Body: 6 x 3/16 inch tube.
 - 2. Bike Hanger: 1-1/2 inch schedule 40 pipe with 1/4 inch plate.
 - 3. Foot: 10 inch diameter x 1/4 inch plate.
 - 4. Tool Tethers: 5/32 inch stainless steel cable.
 - 5. Manual air pump.
 - 6. Included Hand Tools:
 - a. Screwdrivers: Philips and flat head.
 - b. Allen Wrenches: 2.5, 3, 4, 5, 6, and 8 mm.
 - c. Headset wrench.
 - d. Pedal wrench.
 - e. Box Wrenches: 8, 9, 10, and 11 mm.
 - f. Tire levers.
 - 7. Mounting: Floor-mounted.
 - 8. Finish: Hot-dip galvanized (standard).
 - 9. Finish: Powder coated.
 - a. Epoxy primer.
 - b. UV resistant polyester powder coat.
 - c. Minimum thickness: 6 mils.
 - d. Color: To be selected by Architect.
 - e. Color:
 - f. Color: As indicated on Drawings.
 - 10. Finish: Thermoplastic.
 - a. Color: To be selected by Architect.
 - b. Color: ___
 - c. Color: As indicated on Drawings.
- B. Air Kit 2:
 - 1. Main Body: 1-1/2 inch schedule 40 pipe.
 - 2. Foot: 1/4 inch plate.
 - 3. Manual air pump.
 - 4. Mounting: Floor-mounted.
 - 5. Operating Temperature Range: -30 to 120 F.
 - a. Finish: Hot-dip galvanized (standard).
 - 6. Finish: Stainless steel, 304 grade.
 - 7. Finish: Powder coated.

- a. Epoxy primer.
- b. UV resistant polyester powder coat.
- c. Minimum thickness: 6 mils.
- d. Color: To be selected by Architect.
- e. Color:
- f. Color: As indicated on Drawings.
- 8. Finish: Thermoplastic.
 - a. Color: To be selected by Architect.
 - b. Color: _
 - c. Color: As indicated on Drawings.
- C. Air Kit 3:
 - 1. Main Body: 6 x 3/16 inch tube.
 - 2. Foot: 1/4 inch plate.
 - 3. Top: 1/4 inch polycarbonate.
 - 4. Manual air pump.
 - 5. Mounting: Floor-mounted.
 - 6. Operating Temperature Range: -30 to 120 F.
 - 7. Finish: Hot-dip galvanized (standard).
 - 8. Finish: Stainless steel, 304 grade.
 - 9. Finish: Powder coated.
 - a. Epoxy primer.
 - b. UV resistant polyester powder coat.
 - c. Minimum thickness: 6 mils.
 - d. Color: To be selected by Architect.
 - e. Color: _
 - f. Color: As indicated on Drawings.
 - 10. Finish: Thermoplastic.
 - a. Color: To be selected by Architect.
 - b. Color: ___
 - c. Color: As indicated on Drawings.

2.4 BICYCLE SHELTERS

- A. Kolo Shelter:
 - 1. Short Unit with Campus Rack D5: 5 bicycle capacity.
 - 2. Short Unit with Dero Decker Rack (14): 14 bicycle capacity.
 - 3. Short Unit with Ultra Space Saver Rack (6): 6 bicycle capacity.
 - 4. Short Unit with Ultra Space Saver Rack (9): 9 bicycle capacity.
 - 5. Medium Unit with Campus Rack D9: 9 bicycle capacity.
 - 6. Medium Unit with Dero Decker Rack (22): 22 bicycle capacity.
 - 7. Medium Unit with Ultra Space Saver Rack (12): 12 bicycle capacity.
 - 8. Medium Unit with Ultra Space Saver Rack (18): 18 bicycle capacity.
 - 9. Long Unit with Campus Rack D11: 11 bicycle capacity.

BICYCLE RACKS AND LOCKERS

- 10. Long Unit with Dero Decker Rack (30): 30 bicycle capacity.
- 11. Long Unit with Ultra Space Saver Rack (16): 16 bicycle capacity.
- 12. Long Unit with Ultra Space Saver Rack (24): 24 bicycle capacity.
- 13. Uprights: 6 x 1/4 inch square tube.
- 14. Center Member: 6 x 1/4 inch square tube, C6 channel.
- 15. Feet: 1/2 inch plate.
- 16. Rafter: 3/16 inch plate.
- 17. Roof Panels: 1/2 inch UV resistant polycarbonate.
- 18. Finish: Hot-dip galvanized (standard).
- 19. Finish: Powder coated.
 - a. Epoxy primer.
 - b. UV resistant polyester powder coat.
 - c. Minimum thickness: 6 mils.
 - d. Color: To be selected by Architect.
 - e. Color: _
 - f. Color: As indicated on Drawings.
- B. Cycle Station:
 - 1. Capacity per unit with Campus Racks S4: 8 bicycles.
 - 2. Capacity per unit with Campus Racks S4 and side panels: 8 bicycles.
 - 3. Capacity per unit with Hoop Racks (6): 12 bicycles.
 - 4. Capacity per unit with Hoop Racks (5) and side panels: 10 bicycles.
 - 5. Capacity per unit with Space Saver Racks B5 and B7: 12 bicycles.
 - 6. Capacity per unit with Space Saver Racks B5 and B7 and side panels: 12 bicycles.
 - 7. Capacity per unit with Dero Decker (18): 18 bicycles.
 - 8. Capacity per unit with Dero Decker (16) and side panels: 16 bicycles.
 - 9. Uprights: 4 x 3/16 inch square tube.
 - 10. Feet: 1/2 inch plate.
 - 11. Roof Truss: 4 x 3 x 3/16 inch tube.
 - 12. Roof Purlins: 3 x 1/8 inch square tube.
 - 13. Roof Panels: 24 gauge Type S deck, galvanized steel.
 - 14. Panels: 1/4 inch polycarbonate with 1.77 inch square aluminum framing.
 - 15. Panels: 2 x 3/16 inch steel wire mesh with 2 inch steel framing.
 - 16. Finish: Hot-dip galvanized (standard).
 - 17. Finish: Powder coated.
 - a. Epoxy primer.
 - b. UV resistant polyester powder coat.
 - c. Minimum thickness: 6 mils.
 - d. Color: To be selected by Architect.
 - e. Color: ____
 - f. Color: As indicated on Drawings.
- C. Vizor Shelter:
 - 1. Capacity per unit with Campus Rack S6: 6 bicycles.
 - 2. Capacity per unit with Hoop Racks (4): 8 bicycles.
 - 3. Uprights: 4 x 5/16 inch square tube.
 - 4. Feet: 5/8 inch plate.
 - 5. Rafter: $4 \times 2 \times 3/16$ inch tube.
- 6. Purlins: 4 x 2 x 3/16 inch tube.
- 7. Roof Panels: 26 gauge Type S deck, galvanized steel.
- 8. Finish: Hot-dip galvanized (standard).
- 9. Finish: Powder coated.
 - a. Epoxy primer.
 - b. UV resistant polyester powder coat.
 - c. Minimum thickness: 6 mils.
 - d. Color: To be selected by Architect.
 - e. Color: ___
 - f. Color: As indicated on Drawings.
- D. Bike Haven:
 - 1. Capacity per unit with Campus Rack S6: 8 bicycles.
 - 2. Capacity per unit with Hoop Racks (4): 8 bicycles.
 - 3. Capacity per unit with Space Savers B7 double-sided: 14 bicycles.
 - 4. Uprights: 4 x 3/16 inch square tube.
 - 5. Feet: 3/8 inch plate.
 - 6. Roof Member: 4 x 1/8 inch square tube.
 - 7. Roof Member Long: 4 x 2 x 3/16 inch tube.
 - 8. Roof Panels: 26 gauge Type S deck, galvanized steel.
 - 9. Panels: 1/4 inch clear polycarbonate with 1.77 inch square aluminum framing.
 - 10. Finish: Hot-dip galvanized (standard).
 - 11. Finish: Powder coated.
 - a. Epoxy primer.
 - b. UV resistant polyester powder coat.
 - c. Minimum thickness: 6 mils.
 - d. Color: To be selected by Architect.
 - e. Color: _
 - f. Color: As indicated on Drawings.
- E. Pocket Shelter:
 - 1. Capacity per unit with Ultra Space Saver Racks: 6 bicycles.
 - 2. Capacity per unit with Bike File Racks: 10 bicycles.
 - 3. Uprights: 2 x 3/16 inch square tube.
 - 4. Feet: 3/8 inch plate.
 - 5. Horizontal Member: 3/16 inch plate.
 - 6. Roof Member: 3/16 inch plate.
 - 7. Roof Panels: 26 gauge Type S deck, galvanized steel.
 - 8. Side Panels: 1/4 inch clear polycarbonate.
 - 9. Benches: Interior.
 - 10. Benches: Exterior.
 - 11. Finish: Hot-dip galvanized (standard).
 - 12. Finish: Powder coated.
 - a. Epoxy primer.
 - b. UV resistant polyester powder coat.
 - c. Minimum thickness: 6 mils.
 - d. Color: To be selected by Architect.
 - e. Color: _____

- f. Color: As indicated on Drawings.
- 2.5 BICYCLE LOCKERS Dero Bike Locker:
 - 1. Single Sided: 1 bicycle capacity.
 - 2. Double Sided: 2 bicycle capacity.
 - 3. Base: 1.5 inch x 14 gauge square tube.
 - 4. Corners: 14 gauge plate.
 - 5. Sides: 18 gauge plate.
 - 6. Doors: 16 gauge plate.
 - 7. Top: 16 gauge plate.
 - 8. Locking: Keyed lock.
 - 9. Locking: U-lock/padlock handle.
 - 10. Include floor.
 - 11. Finish: Hot-dip galvanized (standard).
 - 12. Finish: Powder coated.
 - a. Epoxy primer.
 - b. UV resistant polyester powder coat.
 - c. Minimum thickness: 6 mils.
 - d. Color: To be selected by Architect.
 - e. Color: _
 - f. Color: As indicated on Drawings.
 - B. Veloport Locker:
 - 1. Capacity: 1 bicycle.
 - 2. Frame: 2 inch x 14 gauge square tube.
 - 3. Back: 18 gauge plate.
 - 4. Sides: 18 gauge plate.
 - 5. Doors: 12 gauge aluminum plate.
 - 6. Locking: Keyed lock.
 - 7. Locking: U-lock/padlock handle.
 - 8. Finish: Hot-dip galvanized (standard).
 - 9. Finish: Powder coated.
 - a. Epoxy primer.
 - b. UV resistant polyester powder coat.
 - c. Minimum thickness: 6 mils.
 - d. Color: To be selected by Architect.
 - e. Color: ____
 - f. Color: As indicated on Drawings.
- 2.6 BICYCLE PARKING SYSTEMS Cycle Stall Basic:
 - 1. Capacity with ___ rack:
 - 2. Capacity with ____ rack:
 - 3. Capacity with ____ rack:
 - 4. Wheel Stops:

- 5. Bollards:
- 6. Color: Yellow.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions: Examine areas and conditions under which Work is to be performed and identify conditions that may be detrimental to proper or timely completion.
- B. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install products in accordance with manufacturer's instructions, approved submittals, and in proper relationship with adjacent construction.
 - 1. Comply with manufacturer's published minimum setback dimensions and recommended mounting heights.

3.3 CLEANING AND PROTECTION

A. Protect from damage during construction operations. Promptly repair any damaged surfaces. Remove and replace work which cannot be satisfactorily repaired.

END OF SECTION

Section 129333 Manufactured Planters

Wilshire Box Linear Planter System

Hanging Fiberglass Planters with Mounting Brackets

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provision of fiberglass planters and steel brackets.

1.2 RELATED WORK

- A. Section 033000 Cast-in-Place concrete
- B. Section 061000 Rough Carpentry

1.3 <u>SUBMITTALS</u>

- A. Product Data: Manufacturer's standard catalog cut sheets.
- B. Samples: As required for color selection or material thickness only.
- C. Shop Drawings: For custom applications, showing critical sizes and dimensions for installation and integration with other work.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Inspect planters after delivery for signs of damage during transit.
- B. Protect planters and brackets from damage during storage and handling.
- C. Store planters and brackets indoors, or at least out of the rain, in their original packaging. Do not stand or walk on planters.

1.5 PROJECT CONDITIONS

- A. Contractor to provide adequate structural support for planter systems.
- B. Protect units from damage by adjacent work.

PART 2 - PRODUCTS

2.1 ACCEPTABLE PRODUCTS/MANUFACTURERS

A. Wilshire Box Linear Planter System, manufactured by Tournesol Siteworks, 30955 San Antonio St., Hayward, CA 94544 Tel: (800) 542-2282 FAX (510) 471-6243 tournesolsiteworks.com

2.2 WILSHIRE BOX LINEAR PLANTER SYSTEMS

A. Material

Planters - All parts shall be constructed of glass fiber reinforced polyester resin.

- Glass fibers shall be PPG or equivalent, uniform chopped strand mat, 3 oz. density. Shorter planters must use min. 2 layers, longer planters must use min. 3 layers (or equivalent amount of sprayed glass).
- 2. Polyester resin shall be compounded by a reputable manufacturer.
- 3. Planter must be internally waterproofed with asphaltic damproofing material.
- 4. Brackets Brackets shall be constructed of ¼" carbon plate steel with support plate heliarc welded. 3/8" Mounting stud to be 304 Stainless steel, welded to plate. Powder coat to be 40% gloss polyester over zinc-rich primer.

B. Construction

Planter - fabricated by either hand layup or spray laminate method, using suitable molds to attain the desired surface finish. The finished reinforced plastic material shall be not less than 5/32" thick and thicker in those areas requiring additional structural strength.

Where ribs or stiffeners are to be fastened to liner sections by laminating over premolded forms, the stiffeners or ribs shall be located and laminated into position before the section to which they are to be attached has passed the gel state of curing, and the finished joint shall be strong and durable. Planters must have bracket pockets to accommodate brackets, with pre-drilled stud mounting holes (one per bracket for 10x12 and 12x18 planters, two per bracket for 18x24 size).

C. Finish:

Planter - Factory finished any of Tournesol Siteworks' standard colors and textures. See catalog or website for available options.

Bracket – Mounting stud to be covered and the entire bracket to be powder coated black (or color to match planter if specified).

- D. Sizes: Wilshire Box planters three available profiles $10^{"W} \times 12^{"H}$, $12^{"W} \times 18^{"H}$, or $18^{"W} \times 24^{"H}$, all available in lengths from $24^{"}$ to $120^{"L}$.
- E. Fire retardant requirement can be met with the addition of retardant chemicals to the resin. Additional information is available for this specification.

2.3 PLANTER ACCESSORIES (OPTIONAL)

- A. Mounting template fabricated template lays out bracket mounting hole locations for easy installation of brackets. One template recommended per length of Wilshire Box planter.
- B. Field installed drainage/irrigation connection fitting. Thread-by-thread thermoplastic drainage adapter, ½" to 4"NPT female thread available. Contractor to locate drainage hole, drill as necessary, and install fitting.
- C. CWM Manual Fill or AutoFill Container Irrigation Systems by Tournesol Siteworks, designed to fit into boxes turnkey. See irrigation specification for details.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Prior to planter or bracket fabrication, the contractor shall verify as-built dimensions of planter area or receptacles to ensure proper size, fit and quantity required.¹
- B. Unless planters have drainage fittings as in 2.3.A, drainage holes to be located and made by contractor in the field to fit to drainage system.

3.2 INSTALLATION

- A. Locate optional template where box is to be installed, mark locations for bracket anchors. Take care that box is mounted level to permit adequate drainage and irrigation.
- B. Drill bracket holes, mount brackets to wall using anchors specified by project engineer.
- C. Place boxes onto brackets, thread nuts onto studs using provided washers and nuts.
- D. Connect irrigation and drainage plumbing, as per drawings.

SECTION 321216 - ASPHALT PAVING

1.1 QUALITY ASSURANCE

A. Regulatory Requirements: Insert applicable standards of Insert name of state or local DOT.

1.2 MATERIALS

- A. Asphalt Materials:
 - 1. Asphalt Binder: ASTM D 6373 or AASHTO M 320, performance graded.
 - 2. Asphalt Cement: ASTM D 3381/D 3381M, viscosity graded ASTM D 946/D 946M, penetration graded.
 - 3. Prime Coat: Cutback asphalt Asphalt emulsion.
 - 4. Tack Coat: Emulsified asphalt.
 - 5. Fog Seal: Emulsified asphalt.
- B. Auxiliary Materials:
 - Recycled Materials: Reclaimed asphalt pavement; reclaimed, unbound-aggregate base material; and recycled tires asphalt shingles and glass.
 - 2. Herbicide.
 - 3. Paving Geotextile: Nonwoven polypropylene.
- C. Mixes:
 - Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 40 Insert value percent or more than 15 percent by weight.
 - a. Surface Course Limit: No more than 10 percent by weight.
- D. Asphalt Mixes: Approved by authorities having jurisdiction and designed according to procedures in AI MS-2.
 - 1. Base Course: Insert mix designation.
 - 2. Surface Course: Insert mix designation.

1.3 INSTALLATION

- A. Cold Milling: 1-1/2 inches 2 inches 3 inches Insert dimension.
- B. Patching Hot-Mix Asphalt Pavement: Base mix for full thickness of patch Base mix with surface layer.
- C. Patching Portland Cement Concrete Pavement with Hot-Mix Asphalt:

- 1. Cracked slabs broken and rolled.
- 2. Rocking slabs stabilized with pumped asphalt.
- 3. Badly cracked pavement excavated and filled with base mix for full thickness of patch.
- D. Repairs to Existing Pavements: Leveling course Cracks and joints filled.
- E. Hot-Mix Asphalt Paving:
 - 1. Subgrade proof rolled.
 - 2. Herbicide applied.
 - 3. Prime coat over unbound-aggregate base course.
 - 4. Base Course: Insert thickness.
 - 5. Surface Course: Insert thickness.
- F. Asphalt curbs.
- G. Asphalt Traffic-Calming Devices: Speed bumps humps cushions and tables.
- H. Surface Treatment: Fog seal Slurry seal.
- 1.4 FIELD QUALITY CONTROL
 - A. Testing Agency: Owner Contractor engaged.

END OF SECTION 321216

SECTION 321243 POROUS FLEXIBLE PAVING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Porous pavement system.

1.2 RELATED SECTIONS

- A. Section [31 20 00 Ó Earth Moving] .
- B. Section [33 46 00 Ó Subdrainage].
- C. Section [32 10 00 Ó Bases, Ballasts, and Paving].
- D. Section [32 30 00 Site Improvements].
- E. Section 32 92 00 Lawns and Grasses .
- F. Section [32 80 00 Ó Irrigation or Section 328413 Ó Drip Irrigation]].

1.3 REFERENCES

- A. ASTM F 1951-08 Standard Specification for Determination of Accessibility of Surface Systems Under and Around Playground Equipment.
- B. ASTM D 638-10 Standard Test Method for Tensile Properties of Plastics
- C. ASTM C 33 Standard Specification for Concrete Aggregates
- D. AASHTO M6 Standard Specification for Fine Aggregate for Hydraulic Cement Concrete

1.4 SYSTEM DESCRIPTION

- A. The Grasspave2 porous pavement system provides vehicular and pedestrian load support for grass areas, while protecting grass roots from harmful effects of traffic.
- B. Major Components of the Complete System
 - 1. Grasspave2 units, assembled in rolls.
 - 2. Engineered sand and gravel base course.
 - 3. Hydrogrow soil amendment and fertilizer, supplied with Grasspave2.
 - 4. Sand fill or USGA greens mix.
 - 5. Selected grass from seed, hydroseeding/hydro-mulching, or sod.
 - 6. Selected topsoil (only for seeded installation).

POROUS FLEXIBLE PAVING

- 7. Mulch (needed only for seeded or hydroseeded installations).
- C. The Grasspave2 grass paving units, sand, and base course work together to support imposed loading.
- D. The Grasspave2 grass paving units, Hydrogrow, and sand fill contribute to vegetation support.
- 1.5 SUBMITTALS
 - A. Submit under provisions of Section 013000.
 - B. Shop Drawings: Submit design detail showing proper cross-section.
 - C. Samples: Submit manufacturer's sample of Grasspave2 10•x 10•section of Grasspave2 material.
 - D. Installation Instructions: Manufacturer¢s printed installation instructions. Include methods for maintaining installed products.
 - E. Certificates:
 - 1. Manufacturer signed certificate stating the product is made in the USA.
 - 2. Submit Material Certificates for base course and sand (or USGA mix) fill materials
 - 3. Product certificates signed by the manufacturer certifying material compliance of polyethylene used to make Grasspave2 units.
 - 4. ISO Certificate certifying manufacturer¢s quality management system is currently registered to ISO 9001:2008 quality standards.
 - F. Substitutions: No material will be considered as an equivalent to the Grasspave2 unit specified herein unless it meets all areas of this specification without exception. Manufacturers seeking to supply what they represent as equivalent material must submit records, data, independent test results, samples, certifications, and documentation deemed necessary by the Specifier to prove equivalency.
 - G. Manufacturer¢s Material Certification: Product manufacturers shall provide certification of compliance with all applicable testing procedures and related specifications upon written request. Request for certification shall be submitted by the purchasing agency no later than the date of order placement.
 - H. Product manufacturers shall also have a minimum of 30 years experience producing products for porous pavement systems.
 - Manufacturer Quality Certification: ISO Certification certifying manufacturer's quality management system for its Grasspave2 system is currently registered to ISO 9001:2008 quality standards. Any alternate materials submitted shall provide a certification that their porous pavement system manufacturing process is part of an ISO program and a certification will be required specifically stating that their testing facility is certified and in accordance with ISO.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Protect Grasspave2 units/rolls from damage during delivery and store rolls upright, under tarp, to protect from sunlight, when time for delivery to installation exceeds one week.
- C. Store Hydrogrow in a dark and dry location
- D. Handling: Protect materials during handling and installation to prevent damage

1.7 MAINTENANCE SERVICE

- A. Installer responsible for maintenance of grass plants Ó water/irrigation, fertilizing, mowing Ó for one growing season. DO NOT AERATE. See Grasspave2 Maintenance Guide from Invisible Structures
- B. System to be maintained by owner, after one growing season.

1.8 Project Conditions

- A. Maintain environmental conditions within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.
- B. Do not begin installation of porous pavements until all hard surface paving adjacent to porous pavement areas, including concrete walks and asphalt paving, is completed.
- C. Install turf when ambient air temperatures is at least 55 degrees F.
- D. In cold weather, do not use frozen materials or materials mixed or coated with ice or frost, and do not build on frozen base or wet, saturated or muddy subgrade.
- E. Protect partially completed paving against damage from other construction traffic when work is in progress.
- F. Adequately water sod or grass seed to assure germination of seed and growth of root system.
- G. Grass coverage on the sand-filled Grasspave2 rings must be completed within one week: See Part 3 Execution.
- H. DO NOT DRIVE, PARK ON, or use Grasspave2 system for two or three mowing cycles until grass root system has matured (about 3 to 4 weeks for sod or 6 to 8 weeks for seeded areas). Any barricades constructed must still be accessible by emergency and fire equipment during and after installation.

1.9 LIMITED WARRANTY

- A. Invisible Structures, Inc. (ISI) warrants to its purchasers that all products furnished by ISI will be free from defects in material and/or workmanship.
- B. This warranty shall be extended for a period of five (5) years following the date of shipment by ISI.
- C. Providing a written claim is presented to ISI within the warranty period and after inspection by ISI showing the materials have failed under this warranty, all defective materials shall be refurnished under this warranty, at no charge, excluding re-installation costs. This in lieu of all other warranties expressed or implied and is the sole warranty extended by ISI.
- D. Our liability under this warranty is limited to the refurnishing of materials and does not include any responsibility for incidental, consequential, or other damages of any nature.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: Invisible Structures, Inc., which is located at: 3510 Himalaya Rd. Suite 200 ; Aurora, CO 80011; Tel: 303-233-8383; Web: www.invisiblestructures.com. B. Substitutions: Not permitted.
- 2.2 GRASSPAVE2
 - A. Composition:
 - 1. Manufactured in the USA.
 - 2. High density polyethylene (HDPE): 100 percent recycled materials. 3. Color: black
 - 3. Color Uniformity: Uniform color throughout all units rolls.
 - 4. Carbon Black for ultraviolet light stabilization.
 - 5. Hydrogrow soil amendment and fertilizer, provided by manufacturer with Grasspave2.
 - B. Performance Properties:
 - 1. Maximum Loading Capability: 15,940 psi (2.29 million psf, 109,906 kPa) when filled with sand.
 - 2. Wheelchair Access testing for ADA Compliance: Passing ASTM F 1951-08.
 - 3. Wheelchair Access testing for ADA Compliance: Passing Rotational Penetrometer testing.
 - 4. Tensile strength, pull-apart testing: 458 lbf/in from ASTM D638 Modified.
 - 5. System Permeability (Grasspave2, sand, base course): 2.63 to 38.55 inches of water per hour.
 - 6. Effective Imperviousness (E.I.): 10%.
 - C. Dimensions (individual units are assembled and distributed into rolls):

- 1. Roll area: From 108 sq ft (10 sq m) to 538 sq ft (50 sq m), in 108 sq ft (10 sq m) increments
- 2. Roll Widths: From 3.3 ft (1 m) to 8.2 ft (2.5 m), in 1.6 ft (0.5 m) increments.
- 3. Roll Lengths: From 32.8 ft (10m) to 65.6 ft (20 m), in 3.3 ft (1 m) increments.
- 4. Roll Weights: From 41 lbs (19kg) to 205 lbs (93kg), in 41 lbs (19 kg) increments.
- 5. Unit Nominal Width by Length: 20 inches by 20 inches (0.5 m by 0.5 m) or 40 inches by 40 inches (1 m by 1 m).
- 6. Nominal Depth: 1 inch (2.5 cm) Ó for rolls and individual units.
- 7. Unit Weight: 18 oz (510 g) or 5 lbs. (2.27 kg).
- 8. Volume Solid: 8 percent.

2.3 SYSTEM MATERIALS

- A. Base Course: Sandy gravel material from local sources commonly used for road base construction (recycled materials such as crushed concrete or crushed asphalt are NOT acceptable).
 - 1. Conforming to the following sieve analysis and requirements:
 - a. 100 percent passing sieve size 1 inch (25 mm).
 - b. 80-100 percent passing sieve size 3/4 inch (19 mm).
 - c. 60-80 percent passing sieve size 3/8 inch (9 mm).
 - d. 40-60 percent passing sieve size #4.
 - e. 25-40 percent passing sieve size #10.
 - f. 5-25 percent passing sieve size #40.
 - g. 0-5 percent passing sieve size #200.
 - 2. Provide a base course material nearly neutral in pH (range from 6.5 to 7.2) to provide adequate root zone development for turf.
 - 3. Material may be either "pit run" or "crusher run." Avoid using clay based crusher run/pit run. Crusher run material will generally require coarse, well-draining sand conforming to AASHTO M6 or ASTM C 33 to be added to mixture (20 to 30 percent by volume) to ensure long-term porosity.
 - 4. Alternative materials such as crushed shell, limerock, or crushed lava may be used for base course use, provided they are mixed with sharp sand (20 to 30 percent) to ensure long-term porosity, and are brought to proper compaction. Without added sand, crushed shell and limerock set up like concrete and become impervious.
 - 5. Alternative size and/or composition of base course materials should be submitted to Invisible Structures, Inc. (Manufacturer) for approval.
- B. Sand Fill for Rings and Spaces Between Rings: Clean sharp sand (washed concrete sand). Choose one of the following:
 - 1. Coarse, well-draining sand, such as washed concrete sand conforming to AASHTO M6 or ASTM C-33.
 - 2. United States Golf Association (USGA) greens, section sand mix ÓThe Root Zone Mixture.•C.
- C. Turf Conditioner:
 - 1. Hydrogrow a proprietary soil amendment manufactured by Invisible Structures, Inc. and provided with Grasspave2.
 - 2. NO SUBSTITUTIONS.
- D. D. Grass Ó Choose either sod or seed:

- 1. Seed: . Use seed materials, of the preferred species for local environmental and projected traffic conditions, from certified sources. Seed shall be provided in containers clearly labeled to show seed name, lot number, net weight, % weed seed content, and guaranteed % of purity and germination. Pure Live Seed types and amount shall be as shown on plans.
 - Mulch Ó needed only for hydroseeding: Wood or paper cellulose commercial mulch materials compatible with hydroseeding operations. Mulch depth according to mulch manufacturers[¢] recommendation. DO NOT use mulch of straw, pine needles, etc., because of their low moisture holding capacity.
 - b. Topsoil Ó needed only for seeding, recommended for hydroseeding:
 Obtain specified topsoil for a light Ódusting (no more than ½ or 13mm) above rings filled with sand for seeding germination.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Examine subgrade and base course installed conditions. Do not start porous paving installation until unsatisfactory conditions are corrected. Check for improperly compacted trenches, debris, and improper gradients.
- B. For fire lane installations: prior to installing base course for turf paving, obtain approval of local fire authorities of sub-base.
- C. Start of installation constitutes acceptance of existing conditions and responsibility for satisfactory performance. If existing conditions are found unsatisfactory, contact Architect for resolution.

3.2 PREPARATION

A. Subgrade Preparation:

- 1. Prepare subgrade as specified in Section 321000. Verify subgrade in accordance with porous paving system manufacturer's instructions.
- 2. Proper subgrade preparation will enable the Grasspave2 rolls/units to connect properly and remain level and stationary after installation.
- 3. Excavate area allowing for unit thickness, the engineered base depth (where required), and 0.5 inch (1.25 cm) for depth of sod root zone or topsoil germination area (when applicable).
- 4. Provide adequate drainage from excavated area if area has potential to collect water, when working with in-place soils that have poor permeability.
- 5. Ensure in-place soil is relatively dry and free from standing water.
- 6. Uniformly grade base.
- 7. Level and clear base of large objects, such as rocks and pieces of wood.
- B. Base Preparation:
 - 1. Install Base as specified in Section 321000. Verify engineered base (if required) is installed in accordance with porous paving system manufacturer^cs instructions.

- 2. Coordinate base installation and preparation with subdrains specified in Section 334600.
- 3. If required, place a geotextile separation layer between the natural ground and the Üengineered base⁽.
- 4. If required, install the specified sub-drain and outlet according to construction drawings.
- 5. Coordinate base installation and preparation with irrigation and drip irrigation lines specified in Section 328000 and 32 84 13, respectively.
- 6. Place engineered base in lifts not to exceed 6 inches (150 mm), compacting each lift separately to
- 7. 95 percent Modified Proctor.
- 8. Leave 1 inch (2.5 cm) of depth below final grade for porous paver unit and sand fill and 0.5 inch

3.3 HYDROGROW INSTALLATION

- A. Spread all Hydrogrow mix provided (spreader rate = 4.53 kg per 100 m2 (10 lbs per 1076 ft2) evenly over the surface of the base course with a hand-held, or wheeled, rotary spreader.
- B. The Hydrogrow mix should be placed immediately before installing the Grasspave2.

3.4 GRASSPAVE2 INSTALLATION

- A. Install the Grasspave2 units by placing units with rings facing up, and using snap-fit connectors, pegs and holes, provided to maintain proper spacing and interlock the units. Units can be easily shaped with pruning shears or knife. Units placed on curves, slopes, and high traffic areas shall be anchored to the base course, using 40d common nails with fender washer, as required to secure units in place. Tops of rings shall be between 6 mm to 13 mm (0.25" to 0.5") below the surface of adjacent hard-surface pavements.
- B. Install sand in rings as they are laid in sections by "back-dumping" directly from a dump truck, or from buckets mounted on tractors, which then exit the site by driving over rings already filled with sand. The sand is then spread laterally from the pile using flat bottomed shovels and/or wide "asphalt rakes" to fill the rings. A stiff bristled broom should be used for final "finishing" of the sand. The sand must be "compacted" by using water from hose, irrigation heads, or rainfall, with the finish grade no less than the top of rings and no more than 6 mm (0.25") above top of rings.

3.5 INSTALLATION OF GRASS

A. Grass coverage on the sand-filled rings must be completed within one week. Sand must be re-installed and leveled and Grasspave2 checked for integrity if rings become exposed due to wind, rain, traffic, or other factors. (Choose one paragraph below to meet grass installation method desired.)

- Preferred method: Hydroseeding/hydro-mulching A combination of water, seed and fertilizer are homogeneously mixed in a purpose-built, truck-mounted tank. The seed mixture is sprayed onto the site at rates shown on plans and per hydroseeding manufacturer's recommendations. Coverage must be uniform and complete. Following germination of the seed, areas lacking germination larger than 20 cm x 20 cm (8" x 8") must be reseeded immediately. Seeded areas must be fertilized and kept moist during development of the turf plants.). DO NOT DRIVE ON SYSTEM:Hydroseeded/hydro-mulch areas must be protected from any traffic, other than emergency vehicles, for a period of 6 to 8 weeks, or until the root system has penetrated and established well below the Grasspave2 units.
- B. Adequately water sod or grass seed to assure germination of seed and growth of root system.

3.6 PROTECTION

- A. Seeded areas must be protected from any traffic, other than emergency vehicles, for a period of 4 to 8 weeks, or until the grass is mature to handle traffic.
- B. Sodded areas must be protected from any traffic, other than emergency vehicles, for a period of 3 to 4 weeks, or until the root system has penetrated below the Grasspave2 units.

3.7 FIELD QUALITY CONTROL

- A. Remove and replace segments of Grasspave2 units where three or more adjacent rings are broken or damaged, reinstalling as specified, so no evidence of replacement is apparent.
- B. Perform cleaning during the installation of work and upon completion of the work. Remove all excess materials, debris, and equipment from site. Repair any damage to adjacent materials and surfaces resulting from installation of this work.

3.8 MAINTENANCE

- A. Maintain grass in accordance with manufacturer¢s instructions and as specified in Section 329200 Manufacturers of Turfs and Grasses.
- B. Lawn Care: Normal turf care procedures should be followed, including de-thatching.
- C. DO NOT AERATE. Aerator will damage the Grasspave2 units. Aeration in not necessary in a sand root zone.
- D. When snow removal is required, keep a metal edged plow blade a minimum of ¾ inch above the surface during plowing operations to avoid causing damage to the Grasspave2 units, or
 - 1. Use a plow blade with a flexible rubber edge, or

POROUS FLEXIBLE PAVING

2. Use a plow blade with skids on the lower outside corners set so the plow blade does not come in contact with the units.

END OF SECTION

SECTION 321316 - DECORATIVE CONCRETE PAVING

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. Colored concrete paving.
- B. Related Requirements:
 - 1. Section 033000 "Cast-in-Place Concrete" for general building applications of concrete.
 - 2. Section 321313 "Concrete Paving" for cast-in-place concrete paving with other finishes, curbs and gutters, and stamped detectable warnings.
 - 3. Section 321373 "Concrete Paving Joint Sealants" for joint sealants in expansion and contraction joints within decorative concrete paving and in joints between decorative concrete paving and other paving or adjacent construction.

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash, slag cement, and other pozzolans.
- B. W/C Ratio: The ratio by weight of water to cementitious materials.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review methods and procedures related to decorative concrete paving, including but not limited to, the following:
 - a. Concrete mixture design.
 - b. Quality control of concrete materials and decorative concrete paving construction practices.
 - c. <Insert agenda item>.
 - 2. Require representatives of each entity directly concerned with decorative concrete paving to attend, including the following:

DECORATIVE CONCRETE PAVING

- a. Contractor's superintendent.
- b. Independent testing agency responsible for concrete design mixtures.
- c. Ready-mix concrete manufacturer.
- d. Decorative concrete paving Installer.
- e. Manufacturer's representative of decorative concrete paving system.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples for Initial Selection: For each type of product, ingredient, or admixture requiring color, pattern, or texture selection.
- C. Samples for Verification: For each type of exposed color, pattern, or texture indicated.
- D. Design Mixtures: For each decorative concrete paving mixture. Include alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1.6 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For the following, from manufacturer:
 - 1. Cementitious materials.
 - 2. Steel reinforcement and reinforcement accessories.
 - 3. Admixtures.
 - 4. Curing compounds.
 - 5. Applied finish materials.
- B. Material Test Reports: For each of the following:
 - 1. Aggregates.[Include service-record data indicating absence of deleterious expansion of concrete due to alkali-aggregate reactivity.]

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer of decorative concrete paving systems.
- B. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.
 - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities" (Quality Control Manual - Section 3, "Plant Certification Checklist").

- C. Testing Agency Qualifications: Qualified according to ASTM C1077 and ASTM E329 for testing indicated.
 - 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
- D. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Build mockups of full-thickness sections of decorative concrete paving to demonstrate typical joints; surface color, pattern, and texture; curing; and standard of workmanship.
 - 2. Build mockups of decorative concrete paving in the location and of the size indicated or, if not indicated, build mockups where directed by Landscape Architect and not less than [96 inches by 96 inches] <Insert dimensions>.
 - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Landscape Architect specifically approves such deviations in writing.
 - 4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified independent testing agency to perform preconstruction testing on decorative concrete paving mixtures.

1.9 FIELD CONDITIONS

- A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.
- B. Cold-Weather Concrete Placement: Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing, or low temperatures. Comply with ACI 306.1 and the following:
 - 1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
 - 2. Do not use frozen materials or materials containing ice or snow.
 - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in design mixtures.
- C. Hot-Weather Concrete Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:

- Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated in total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
- 2. Cover steel reinforcement with water-soaked burlap, so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
- 3. Fog-spray forms[, steel reinforcement,] and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

PART 2 - PRODUCTS

- 2.1 CONCRETE, GENERAL
 - A. ACI Publications: Comply with ACI 301 unless otherwise indicated.

2.2 FORMS

- A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, and smooth exposed surfaces.
 - 1. Use flexible or uniformly curved forms for curves of a radius of 100 feet or less. [Do not use notched and bent forms.]
- B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces.

2.3 STEEL REINFORCEMENT

- A. Plain-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, fabricated from as-drawn steel wire into flat sheets.
- B. Reinforcing Bars: ASTM A615/A615M, Grade 60; deformed.
- C. Steel Bar Mats: ASTM A184/A184M; with ASTM A615/A615M, Grade 60 deformed bars; assembled with clips.
- D. Joint Dowel Bars: ASTM A615/A615M, Grade 60 plain-steel bars. Cut bars true to length with ends square and free of burrs.

- E. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded-wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete specified, and as follows:
 - 1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.

2.4 CONCRETE MATERIALS

- A. Cementitious Materials:
 - 1. Portland Cement: ASTM C150/C150M, [gray] [white] portland cement [Type I] [Type II] [Type I/II] [Type III] [Type V].
- B. Normal-Weight Aggregates: ASTM C33/C33M, , uniformly graded. Provide aggregates from a single source with documented service-record data of at least 10 years' satisfactory service in similar paving applications and service conditions using similar aggregates and cementitious materials.
 - 1. Maximum Coarse-Aggregate Size: 3/4 inchnominal.
 - 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Air-Entraining Admixture: ASTM C260/C260M.
- D. Chemical Admixtures: Admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.
- E. Color Pigment: ASTM C979/C979M, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, nonfading, and resistant to lime and other alkalis.
 - 1. Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. Davis Integral Color.
- F. Water: Potable and complying with ASTM C94/C94M.

2.5 CONCRETE MIXTURES

A. Obtain each color, size, type, and variety of concrete mixture from single manufacturer with resources to provide concrete of consistent quality in appearance and physical properties.

- B. Prepare design mixtures, proportioned according to ACI 301, for each type and strength of normal-weight concrete, and as determined by either laboratory trial mixtures or field experience.
 - 1. Use a qualified independent testing agency for preparing and reporting proposed concrete design mixtures for the trial batch method.
- C. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content as follows:
 - 1. Air Content:
 - a. 5 percent plus or minus 1.5 percent for 3/4-inch nominal maximum aggregate size.
- D. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.
 - 1. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
- E. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.
- F. Concrete Mixtures: Normal-weight concrete.
 - 1. Compressive Strength (28 Days): 3000 psi.

2.6 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C94/C94M[and ASTM C1116/C1116M]. Furnish batch certificates for each batch discharged and used in the Work.
 - 1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.
- B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C94/C94M. Mix concrete materials in appropriate drum-type batch machine mixer.
 - 1. For concrete batches of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
 - 2. For concrete batches larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd..

3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixing time, quantity, and amount of water added.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.
- B. Proof-roll prepared subbase surface below [decorative concrete paving] <Insert locations> to identify soft pockets and areas of excess yielding.
 - 1. Completely proof-roll subbase in one direction[and repeat in perpendicular direction]. Limit vehicle speed to 3 mph.
 - 2. Proof-roll with a pneumatic-tired and loaded, 10-wheel, tandem-axle dump truck weighing not less than 15 tons.
 - 3. Correct subbase with soft spots and areas of pumping or rutting exceeding depth of [1/2 inch] <Insert dimension> according to requirements in Section 312000 "Earth Moving."
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove loose material from compacted subbase surface immediately before placing concrete.
- B. Protect adjacent construction from discoloration and spillage during application of color hardeners, release agents, stains, curing compounds, and sealers.

3.3 EDGE FORMS AND SCREED CONSTRUCTION

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.
- B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.4 INSTALLATION OF STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

- B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.
- C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.
- D. Install welded-wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.
- E. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as required before placement. Set mats for a minimum 2-inch overlap to adjacent mats.

3.5 JOINTS

- A. General: Form construction, isolation, and contraction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated.
 - 1. When joining existing paving, place transverse joints to align with previously placed joints unless otherwise indicated.
- B. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour unless paving terminates at isolation joints.
 - 1. Continue steel reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of paving strips unless otherwise indicated.
 - 2. Butt Joints: Use epoxy-bonding adhesive at joint locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
 - 3. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.
- C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.
 - 1. Locate expansion joints at intervals of [50 feet] <Insert dimension> unless otherwise indicated.
 - 2. Extend joint fillers full width and depth of joint.
 - 3. Terminate joint filler not less than 1/2 inch or more than 1 inch below finished surface if joint sealant is indicated.
 - 4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
 - 5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.

- 6. During concrete placement, protect top edge of joint filler with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.
- D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows[, to match jointing of existing adjacent decorative concrete paving]:
 - 1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a [1/4-inch] [3/8-inch] radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate grooving-tool marks on concrete surfaces.
 - a. Tolerance: Ensure that grooved joints are within [3 inches] <Insert dimension> either way from centers of dowels.
 - 2. Doweled Contraction Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.
- E. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 3/8-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate edging-tool marks on concrete surfaces.

3.6 CONCRETE PLACEMENT

- A. Before placing concrete, inspect and complete formwork installation[, steel reinforcement,] and items to be embedded or cast-in.
- B. Remove snow, ice, or frost from subbase surface[and steel reinforcement] before placing concrete. Do not place concrete on frozen surfaces.
- C. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.
- D. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.
- E. Do not add water to concrete during delivery or at Project site. Do not add water to fresh concrete after testing.
- F. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.
- G. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.

- 1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies[, reinforcement,] or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating [reinforcement] [dowels] [and] joint devices.
- H. Screed paving surface with a straightedge and strike off.
- Commence initial floating using bull floats or darbies to impart an open-textured and uniform surface plane before excess moisture or bleedwater appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

3.7 FLOAT FINISHING

- A. General: Do not add water to concrete surfaces during finishing operations.
- B. Float Finish: Begin the second floating operation when bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.

3.8 INTEGRALLY COLORED CONCRETE FINISH

- A. Integrally Colored Concrete Finish: After final floating, apply the following finish:
 - 1. Medium-to-Fine-Textured Broom Finish: Draw a soft-bristle broom across float-finished concrete surface, perpendicular to line of traffic, to provide a uniform, fine-line texture.

3.9 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
- B. Comply with ACI 306.1 for cold-weather protection.
- C. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- D. Curing Compound: Apply immediately after final finishing. Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating, and repair damage during curing period.
 - 1. Cure integrally colored concrete with a [pigmented] curing compound.

DECORATIVE CONCRETE PAVING

3.10 PAVING TOLERANCES

- A. Comply with tolerances in ACI 117 and as follows:
 - 1. Elevation: 3/4 inch.
 - 2. Thickness: Plus 3/8 inch, minus 1/4 inch.
 - 3. Surface: Gap below 10-foot- long, unleveled straightedge not to exceed 1/2 inch.
 - 4. Lateral Alignment and Spacing of Dowels: 1 inch.
 - 5. Vertical Alignment of Dowels: 1/4 inch.
 - 6. Alignment of Dowel-Bar End Relative to Line Perpendicular to Paving Edge: 1/4 inch per 12 inches of dowel.
 - 7. Joint Spacing: 3 inches.
 - 8. Contraction Joint Depth: Plus 1/4 inch, no minus.
 - 9. Joint Width: Plus 1/8 inch, no minus.

3.11 REPAIR AND PROTECTION

- A. Remove and replace decorative concrete paving that is broken or damaged or does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Landscape Architect.
- B. Protect decorative concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.
- C. Maintain decorative concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

3.12 DECORATIVE CONCRETE PAVING SCHEDULE

- A. Patterned Decorative Concrete Paving :
 - 1. Locations: Install at sidewalks indicated on Materials Plans.
 - 2. Coloring Method: Integrally colored.
 - a. Color: Davis Integral Color Sandstone.

END OF SECTION 321316

SECTION 321400 - UNIT PAVING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Concrete pavers set in mortar setting beds.

1.2 SUBMITTALS

- A. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Test Reports: three copies, showing compliance with specified ASTM requirements.
 - 2. Preparation instructions and recommendations.
 - 3. Storage and handling requirements and recommendations
 - 4. Installation methods.
- B. Shop Drawings:
 - 1. Layout drawings of each paved area showing the pattern of pavers, indicate pavers requiring cutting, indicate setting bed methods in each area, drainage patterns and drains.
- C. Selection samples of full color range.

1.3 PROJECT CONDITIONS

- A. Cold-Weather Protection: Do not use frozen materials or build on frozen subgrade or setting beds.
- В.

.

- C. Weather Limitations for Mortar and Grout:
 - 1. Cold-Weather Requirements: Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
 - 2. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602. Do not apply mortar to substrates with temperatures of 100 deg F and higher.

PART 2 - PRODUCTS

2.1 CONCRETE PAVERS (PEDESTRIAN RATED)

- A. Concrete Pavers: Solid interlocking paving units complying with ASTM C 936 and resistant to freezing and thawing when tested according to ASTM C 67, made from normal-weight aggregates.
 - 1. Manufacturer:
 - a. Hanover Architectural Products
 - 1) 5000 Hanover Road, Hanover, PA 17331
 - 2) (717) 637-0500
 - 2. Thickness: 2"
 - 3. Face Size and Shape: 11 3/4" X 17 7/8" rectangle .
 - 4. Color: Prest Paver, Natural 71
 - 5. Finish: Ground Finish
 - 6.

2.2 CONCRETE PAVERS (VEHICULAR RATED)

First paragraph below applies to most standard units.

A. Concrete Pavers: Solid interlocking paving units complying with ASTM C 936 and resistant to freezing and thawing when tested according to ASTM C 67, made from normal-weight aggregates.

See Editing Instruction No. 1 in the Evaluations for cautions about naming manufacturers. See Division 01 Section "Product Requirements."

- 1. Manufacturer:
 - a. Hanover Architectural Products
 - 1) 5000 Hanover Road, Hanover, PA 17331
 - 2) (717) 637-0500

Standard-duty interlocking concrete pavers are usually 2-3/8 inches (60 mm) thick; heavy-duty units are usually 3-1/8 inches (80 mm) thick.

2. Thickness: 4"

Retain and revise one of first three subparagraphs below to specify face size and shape. Maximum length per ASTM C 936 is 9-1/2 inches (241 mm) for 2-3/8-inch- (60-mm-) thick units, 12-1/2 inches (318 mm) for 3-1/8-inch- (80-mm-) thick units.

- 3. Face Size and Shape: 6" X 12" rectangle .
- 4. Color: Chapel Stone, Grey Blend 71

UNIT PAVING

2.3 ACCESSORIES

A. Compressible Foam Filler: Preformed strips complying with ASTM D 1056, Grade 2A1.

2.4 AGGREGATE SETTING-BED MATERIALS

- A. Graded Aggregate for Base: Sound, crushed stone or gravel complying with requirements in Division 31 Section "Earth Moving" for base course.
- B. Sand for Joints: Fine, sharp, washed, natural sand or crushed stone with 100 percent passing No. 16 sieve and no more than 10 percent passing No. 200 sieve.
- C. Herbicide: Commercial chemical for weed control, registered with the EPA. Provide in granular, liquid, or wettable powder form.

2.5 MORTAR SETTING-BED MATERIALS

- A. Portland Cement: ASTM C 150, Type I or Type II.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Sand: ASTM C 144.
- D. Water: Potable.

2.6 MORTAR AND GROUT MIXES

- A. General: Comply with referenced standards and with manufacturers' written instructions Discard mortars and grout if they have reached their initial set before being used.
- B. Mortar-Bed Bond Coat: Mix neat cement and water to a creamy consistency.
- C. Portland Cement-Lime Setting-Bed Mortar: Type M complying with ASTM C 270, Proportion Specification.
- D.

.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Mix pavers from several pallets or cubes, as they are placed, to produce uniform blend of colors and textures.
- B. Cut unit pavers with motor-driven masonry saw equipment to provide pattern indicated and to fit adjoining work neatly. Use full units without cutting where possible.
 - 1. For concrete pavers, a block splitter may be used.
- C. Joint Pattern: Running Bond. .
- D. Tolerances: Do not exceed 1/16-inch unit-to-unit offset from flush (lippage) nor 1/8 inch in 24 inches and 1/4 inch in 10 feet from level, or indicated slope, for finished surface of paving.
- E. Expansion and Control Joints: Provide for sealant-filled joints at locations and of widths indicated. Provide compressible foam filler as backing for sealant-filled joints unless otherwise indicated; where unfilled joints are indicated, provide temporary filler until paver installation is complete. Install joint filler before setting pavers. Sealant materials and installation are specified in Division 07 Section "Joint Sealants."

3.2 MORTAR SETTING-BED APPLICATIONS

- A. Saturate concrete subbase with clean water several hours before placing setting bed. Remove surface water about one hour before placing setting bed.
- B. Apply mortar-bed bond coat over surface of concrete subbase about 15 minutes before placing mortar bed. Limit area of bond coat to avoid its drying out before placing setting bed. Do not exceed 1/16-inch thickness for bond coat.
- C. Apply mortar bed over bond coat; spread and screed mortar bed to uniform thickness at subgrade elevations required for accurate setting of pavers to finished grades indicated.
- D. Mix and place only that amount of mortar bed that can be covered with pavers before initial set. Before placing pavers, cut back, bevel edge, and remove and discard setting-bed material that has reached initial set.
- E. Place pavers before initial set of cement occurs. Immediately before placing pavers on mortar bed, apply uniform 1/16-inch- thick bond coat to mortar bed or to back of each paver with a flat trowel.

- F. Tamp or beat pavers with a wooden block or rubber mallet to obtain full contact with setting bed and to bring finished surfaces within indicated tolerances. Set each paver in a single operation before initial set of mortar; do not return to areas already set or disturb pavers for purposes of realigning finished surfaces or adjusting joints.
- G. Sand sweep joints with polymeric sand.

END OF SECTION 321400

SECTION 321543 - AGGREGATE PAVEMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. The work of this Section consists of all paving work and related items as indicated on the drawings and or as specified herein and includes, but is not limited to, the following items:
 - 1. StaLok[®] Paving Material aggregate pathway or patio surfacing
- B. Related Sections:
 - 1. Section 02100 Site Preparation
 - 2. Section 02200 Earthwork
 - 3. Section 02230 Granular Materials
- C. General Provisions
 - 1. All of the contract documents, including General and Supplementary Conditions and Division I General Requirements, apply to the work of this Section.
 - 2. Examine all drawings and all other Sections of the Specifications for requirements therein affecting the work of this trade.
 - Coordinate work with that of all those affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.2 PERFORMANCE REQUIREMENTS

- A. The following standards and definitions are applicable to the work of this Section to the extent referenced herein:
 - 1. Standard Specifications: Highway Department, Standard Specifications for Highways and Bridges, latest edition.
 - 2. ASTM: American Society for Testing and Materials.
 - 3. AASHTO: American Association of State Highway and Transportation Officials.

1.3 SAMPLES AND SUBMITTALS

- A. Sieve analysis of aggregate for pathways and patios.
- B. Samples and or shop drawings for the following:
 - 1. Aggregate for strength and color.
- C. LEED Submittals

AGGREGATE PAVEMENT

- 1. Credit MR 5 Regional Materials: Attach product data for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.
- D. Construction Samples:
 - 1. Construct mock-up panels or areas for each different type of paving system as specified herein to demonstrate ability to archive types of setting bed, joints, pattern, color and texture required herein.
 - 2. StaLok® Paving Material for aggregate pathway and patio surfacing: Construct a 12' x 24' sample of finished path as directed by the Owner's Representative on site.
 - 3. General:
 - a. Schedule mock-up construction so that mock-up can be accepted a minimum of 30 days prior to the application of paving surfaces represented by the mock-up.
 - b. Locate mock-up panel(s) in areas as directed by the Owner's Representative.
 - c. Continue to construct mock-ups until acceptable mock-up is produced (at no cost to the Owner). Acceptable mock-up shall be standard for texture, color and workmanship.
 - d. Use same setting bed and joint mixes used in accepted mock-up in final work unless otherwise directed by Owner's Representative.
 - e. Protect accepted mock-ups from damage until completion and acceptance of the work represented by the mock-ups.
 - f. Remove mock-up panel(s) from the site at completion of the project, unless otherwise instructed by Owner's Representative.

1.4 PROJECT/SITE CONDITIONS

- A. Field Measurements: Each bidder is required to visit the site of the work to verify the existing conditions. No adjustments will be made to the Contract Sum for variations in the existing conditions.
 - 1. Where surfacing is indicated to fit with other construction, verify dimensions of other construction by field measurements before proceeding with the work.
 - 2. Before proceeding with work, notify the owner¢s representative in writing of unsuitable conditions and conflicts.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Installer to provide evidence to indicate successful experience in installation of StaLok® Paving Material or approval by manufacturer.
- B. Manufacturer's technical representative shall visit the site at the start of an installation to ensure the installer understands the correct installation methods to use.

1.6 WARRANTY

- A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- B. Special Warranty: Submit a written warranty executed by the installer agreeing to repair or replace components of StaLok® Paving Material that fail in materials or workmanship within the specified warranty period. Failures include, but are not limited to, the following:
 - 1. Premature wear and tear, provided the material is maintained in accordance with manufacturer¢s written maintenance instructions.
 - 2. Failure of system to meet performance requirements.
- C. Warranty Period: Contractor shall provide warranty for performance of product. Contractor shall warranty installation of product for the time of one year from completion.
- D. Contractor shall provide, for a period of sixty days, unconditional maintenance and repairs as required.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. StaLok® Paving Material Waterless Natural Pavement is provided by the following manufacturer:
 - Stabilizer Solutions, Inc. 33 South 28th St., Phoenix, AZ 85034; phone (602) 225-5900, (800) 336-2468; fax (602) 225-5902; website www.stabilizersolutions.com; email info@stabilizersolutions.com
 - Substitutions allowed in accordance with Section 012500 "Substitution Procedures"

2.2 MATERIALS

- A. Aggregate Specifications
 - 1. Crushed stone shall consist of inert materials that are hard, durable, with stone free from surface coatings and deleterious materials. Gradation requirements shall be as follows:

В.	U.S. Sieve No.	C.	Percent Passing by Weight
----	----------------------	----	------------------------------
D.	# ½-inch	E.	98-100
----	---------------	----	--------
F.	# 3/8-inch	G.	90-100
Н.	# 4	Ι.	65-80
J.	# 8	К.	48-63
L.	# 16	M.	40-49
N.	# 30	О.	30-40
P.	# 50	Q.	20-27
R.	# 100	S.	10-18
Т.	# 200	U.	10-12

- 1. R-value minimum of 70 determined by ASTM D 2488 Methodology (R-value is a measure of wear resistance).
- 2. Sand equivalent Ó an engineering measurement of the proportion of sand to silt and clay, will stay at a range of 30-55. As determined by ASTM D 2419 methodology.
- 3. Dense graded crushed stone base shall be furnished and installed as required and specified under Section 02200, Earthwork and Section 02230 Granular Materials to a 6-compacted depth.

PART 3 - EXECUTION

3.1 PREPARATION

- Base shall be 3-thick layer of your state¢s DOT crushed granular base material installed at 95% compaction on top of subgrade by Test Method ASTM D 1557.
 Compaction testing to be provided by project owner no less than one test per 2,000 square feet of pavement base layer.
- B. Make any corrections necessary to base furnished and installed under Section 02200 Earthwork and Section 02230 Granular Materials to bring gravel to the sections and elevations shown on the drawings.
- C. Pre-soak base material with water prior to installing StaLok® Paving Material as needed to compact base.
- D. Make sure proper drainage is available to ensure no standing water on surface or adjacent to StaLok® Paving Material, including downspouts when placed under roof overhang.

3.2 BLENDING

- A. Waterless Natural Pavement (WNP) blending shall be under the direction of a WNP manufacturer with not less than 10 years experience in the production of WNP product. WNP shall be prepared with mixing plant dedicated to WNP production and equipped with metering controls for accurate proportioning of WNP ingredients. Aggregate must be heated to 200 degrees Fahrenheit by use of drum dryer prior to blending.
- B. The mixed WNP shall have a dry static coefficient of friction greater than .60. Water shall bead or form droplets on WNP surface and shed off. WNP shall set up only by compaction and can be stockpiled up to 1 month prior installation.

3.3 PLACEMENT/COMPACTION

- A. Consult manufacturer if installing on slope.
- B. Do not install in rainy conditions.
- C. Avoid installing WNP Material below 30°F. WNP Material may form clods during transport below 60°F. Large clods may be broken apart with machinery such as front loader, or on their own if left to warm in sun. Small clods will break apart during placement and compaction.
- D. Place WNP at a minimum 2, maximum 3 compacted depth. Using a Paver Box, Paver, Crawler Paver, Asphalt Paver, Drag Box Paver, Pavement Profiler, Slip Form Paver, Pav-Saver Place Spreader, Front Loader or Equal.
 - 1. Crown WNP. Slope material to edge ¼•per foot.
 - 2. Pockets of large aggregate may develop, inspect surface and evenly spread any 1/4 or 3/8 loose rock.
- E. Compact WNP.
 - 1. Compaction can be achieved by a 1 to 5-ton double-drum roller
 - 2. Lightly compact making one pass.
 - 3. Make any grade adjustments and add needed material.
 - 4. Heavily compact material making 8 to 10 passes. Avoid turning on material with roller.
 - 5. Use plate compactor on edges and hard to get areas. If near wall, hand tamp may be necessary.
 - 6. Loose material shall not be present on final surface.
 - 7. No set up or curing time is needed.

3.4 INSPECTION

A. Finished surface shall be uniform and solid, with no evidence of chipping or cracking. Compacted paving material shall be firm to full depth with no soft areas. Loose material shall not be present on the surface and no ruts shall be present. Compaction may increase with time and use. WNP shall be ready for traffic immediately and shall not require fog seal or any other sealing or curing methods.

3.5 MAINTENANCE

A. Remove debris, such as paper, grass clippings, leaves or other organic material by mechanically blowing or hand raking the surface as needed. Any plowing program required during winter months shall involve the use of a rubber baffle on the plow blade or wheels on the plow that lifts the blade 1/4" off the paving surface.

3.6 REPAIRS

- A. Excavate damaged area to the depth of the WNP and square-off sidewalls.
- B. If area is dry, moisten damaged portion lightly and scarify.
- C. Apply pre-blended WNP to excavated area to finish grade.
- D. Compact with an 8•to 10•hand tamp or 1000 lb. Roller.
- E. END OF SECTION

SECTION 321713 - PARKING BUMPERS

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 wheel stops.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples for Initial Selection: For each type of exposed finish requiring color selection.

PART 2 - PRODUCTS PARKING BUMPERS

- A. Concrete Wheel Stops: Precast, steel-reinforced, air-entrained concrete, 4000-psi minimum compressive strength, 4-1/2 incheshigh by 9 incheswide by 72 incheslong. Provide chamfered corners, transverse drainage slots on underside, and a minimum of two factory-formed or -drilled vertical holes through wheel stop for anchoring to substrate.
 - 1. Surface Appearance: Free of pockets, sand streaks, honeycombs, and other obvious defects. Corners shall be uniform, straight, and sharp.
 - 2. Mounting Hardware: Galvanized-steel hardware as standard with wheel-stop manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that pavement is in suitable condition to begin installation according to manufacturer's written instructions.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install wheel stops according to manufacturer's written instructions unless otherwise indicated.
- B. Securely anchor wheel stops to pavement with hardware in each preformed vertical hole in wheel stop as recommended in writing by manufacturer. Recess head of hardware beneath top of wheel stop.

END OF SECTION 321713

SECTION 321816.13 - PLAYGROUND PROTECTIVE SURFACING

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. Inorganic loose-fill surfacing.

1.3 DEFINITIONS

- A. Definitions in ASTM F 2223 apply to Work of this Section.
- B. Critical Height: Standard measure of shock attenuation according to ASTM F 2223; same as "critical fall height" in ASTM F 1292. According to ASTM F 1292, this approximates "the maximum fall height from which a life-threatening head injury would not be expected to occur."

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For [Installer] [and] [testing agency].
- B. Material Certificates: For each type of loose-fill surfacing.
- C. Field quality-control reports.
- D. Sample Warranty: For manufacturer's special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For playground protective surfacing to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.8 WARRANTY

- A. Special Warranty: Manufacturer and Installer agree to repair or replace components of protective surfacing that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Reduction in impact attenuation as measured by reduction of critical fall height.
 - b. Deterioration of protective surfacing and other materials beyond normal weathering.
 - C.
 - 2. Warranty Period: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain protective surfacing materials[, including loose-fill accessories,] from single source from single manufacturer.
 - 1. Provide geosynthetic accessories of each type from source recommended by manufacturer of protective surfacing materials.

2.2 PERFORMANCE REQUIREMENTS

- A. Impact Attenuation: Critical fall height tested according to ASTM F 1292.
- B. Accessibility Standard: Minimum surfacing performance according to ASTM F 1951.
- 2.3 INORGANIC LOOSE-FILL SURFACING
 - A. Shredded Rubber: Rubber particles, free from steel wires, rubber dust, and other foreign substances, tested for impact attenuation according to ASTM F 1292[and for accessibility according to ASTM F 1951].
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:

PLAYGROUND PROTECTIVE SURFACING

- a. GameTime; a PlayCore, Inc. company.
- 2. Uncompressed Material Depth: Not less than as indicated on Drawings.
- 3. Color(s): As selected by Architect from manufacturer's full range.
- B. Inorganic Aggregate Materials: Clean, washed, and free of loam, clay, organic matter, debris, and other foreign substances.
 - 1. Uncompressed Material Depth: Not less than 12 inches.

2.4 GEOSYNTHETIC ACCESSORIES

- A. Drainage/Separation Geotextile: Nonwoven, needle-punched geotextile, manufactured for drainage applications and made from polyolefins or polyesters; with the following minimum properties:
 - 1. Weight: 4 oz./sq. yd.; ASTM D 5261.
 - 2. Water Flow Rate: 150 gpm/sq. ft. according to ASTM D 4491.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for subgrade elevations, slope, and drainage and for other conditions affecting performance of the Work.
 - 1. Verify that substrates are sound and without high spots, ridges, holes, and depressions.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates to receive surfacing products according to protective surfacing manufacturer's written instructions.

3.3 INSTALLATION OF GEOSYNTHETIC ACCESSORIES

- A. Install geosynthetic accessories before edging and according to playground surface system manufacturer's and geosynthetic manufacturer's written instructions and in a manner that cannot become a tripping hazard.
 - 1. Drainage/Separation Geotextile: Completely cover area beneath protective surfacing, overlapping geotextile sides and edges a minimum of 4 inches with manufacturer's standard treatment for seams.

PLAYGROUND PROTECTIVE SURFACING

3.4 INSTALLATION OF LOOSE-FILL SURFACING

- A. Apply components of loose-fill surfacing according to manufacturer's written instructions to produce a uniform surface.
- B. Loose Fill: Place loose-fill materials to required depth after installation of playground equipment support posts and foundations. Include manufacturer's recommended amount of additional material to offset natural compaction over time.
- C. Grading: Uniformly grade loose fill to an even surface free from irregularities.
- D. Compaction: After initial grading, mechanically compact loose fill before finish grading.
- E. Finish Grading: Hand rake to a uniformly smooth finished surface and to required elevations.
- 3.5 FIELD QUALITY CONTROL
 - A. Testing Agency: Engage a qualified testing agency to perform tests.
 - B. Perform the following tests[with the assistance of a factory-authorized service representative]:
 - 1. Perform "Installed Surface Performance Test" according to ASTM F 1292 for each protective surfacing type and thickness in each playground area.
 - C. Playground protective surfacing will be considered defective if it does not pass tests.
 - D. Prepare test reports.

3.6 PROTECTION

A. Prevent traffic over surfacing for not less than 48 hours after installation.

END OF SECTION 321816.13

SECTION 321816.14 - POURED-IN-PLACE GRANULAR RUBBER SURFACING

PART 1 - GENERAL

- 1.1 WORK INCLUDED: Work in this section includes furnishing all labor, materials, equipment, and services required to install all poured-in-place granular rubber surfacing. It will be completed to drawing details and specifications.
- 1.2 RELATED WORK SPECIFIED ELSEWHERE: poured-in place concrete, compacted crushed stone, asphalt, interlocking brick, geotextile fabric or filter cloth, marine plywood or other approved substrate & retaining walls.
- 1.3 SUBMITTAL: Submit full range of sample colors and finishes available & sales literature.
- 1.4 DELIVERY AND STORAGE: Deliver materials in manufacturer¢s clearly labeled, unopened containers. Store and handle in a manner which will prevent intrusion of foreign matter and will assure protection from weather. All resins and solvents should be stored at a temperature of not less than 0 degrees C (32 degrees F).
- 1.5 SCHEDULING: Co-ordinate the delivery of the materials with the scheduled time of installation to insure minimum storage time at the project site.
- 1.6 WARRANTY: All materials under this section shall be installed by a dealer authorized by the manufacturer and shall be guaranteed by the manufacturer against defects only as described in the manufacturer's warranty to the authorized dealer. The labour and installation warranty period for Playgrounds, Splash Pads, Waterparks, Animal-use Facilities, Golf Courses, Garages, Driveways or any other Commercial or non-residential application shall be ONE to FIVE (1 Ó 5) YEARS and the warranty for Residential foot-traffic-only applications shall be ONE to TEN (1 10) YEARS as specified and provided by the authorized dealer.
- 1.7 CONTRACTOR: The authorized dealer must have installed at least 25 applications of a similar size project and have a minimum of 5 years of experience in the poured-in-place rubber safety surfacing industry.
- 1.8 JOB CONDITIONS: The air temperature is recommended to be above 5 degrees C (41 degrees F) day and night. Any temperatures below this may affect the speed and quality of the installation.

PART 2 - PRODUCTS

2.1MANUFACTURER: Recycled granular or virgin EPDM or SBR rubber granules andPOURED-IN-PLACE GRANULAR RUBBER321816.14 - 2SURFACING321816.14 - 2

accessory materials such as binders and solvents shall be as produced and/or supplied by Rubaroc or equal as approved by the client.

2.2 MATERIALS:

- A. Granules Pure vulcanized EPDM rubber chips ranging in size 1 4mm. EPDM rubber shall be UV stable.
- B. Binder- Resin (Chemical Family: Aromatic (Standard Resins) or Aliphatic (UV Resins) Isocyanate). Binder shall be 100% urethane and contain no TDI. Accelerators may be used with aliphatic binders. (Aliphatic binders should be considered on indoor applications where there is UV exposure or where light coloured rubber granules are used).
- C. Primer Ó Aromatic or Aliphatic Resin thinned with solvent.
- D. Matrix- Resin mixed with a thickening agent, used as a base coat to allow application of rubber on vertical surfaces such as stair risers and concrete pool copings.
- E. Finished Floor Properties:
 - 1. Surface to withstand 600-psi tensile stress.
 - 2. Surface to be slip resistant when wet or dry.
 - 3. Surface to be fungus resistant (trace to no growth).
 - 4. Surface to have chemical resistance (treated surface immersed for 24 hours) so that there is no effect from oil, lye, hydrochloric acid, animal fat, grease, acetone, tolidine, alcohol, blood, chlorine, urine, detergents and insect spray.
- F. FINISHES: Pool Decks, Splash pads, Patios, Walkways, Driveways, Cart paths etc.
 - 1. Impact absorbing, cushioned surface
 - 2. Condition of the substrate must be approved by authorized Rubaroc representative
 - 3. Logos or designs can be incorporated into the finished surface
 - 4. Rubaroc surface to be minimum 6mm and maximum of 12mm thick
 - 5. Pool decks should be left for 1-2 days before general use, and splash pads should be left for 5 days before general use.
- G. FINISHES: Splash pad, Water play (two-tier system)
 - 1. Two-tier system over compacted "A" Gravel.
 - 2. Base of Rubaroc full profile water play system to consist of recycled EPDM or SBR (plus optional pea- stone) mix. Rubber to be no less than 80% of mixture.
 - 3. Base to be no installed to specified depth.
 - 4. Base coat binder to be used in the base layer.
 - 5. Base coat to dry for no less than 24 hours.
 - 6. Apply standard Rubaroc 6 Ó 12 mm EPDM topcoat to colour specified.
 - 7. Rubaroc water play systems should be left for 5 days before general use.

2.3 TESTING: The system should be tested to the following standard.

A. Hardness: ASTM D-2444 94% recovery

POURED-IN-PLACE GRANULAR RUBBER SURFACING

- B. Water Absorption: ASTM D-530 +6.5%
- C. Ultraviolet Resistance: ASTM D-3137
- D. Fungal Resistance: Trace to no growth: ASTM G-21
- E. Spread of Flame Resistance: ANSI/UL 790 (ULC-S107) Class A
- F. Accelerated: weathering no change after 2000 hours
- G. Freeze /Thaw: no change after 30 days at minus 50 in 24-hour period

PART 3 - EXECUTION

3.1 PREPARATION:

- A. All sub surfaces will be inspected prior to application and any discrepancies will be reported to the owner or his agent. Installation will not proceed until any problems are rectified. Unless specified the owner is responsible for the subbase. (substrate)
- B. Clean the substrate with broom or shop-vac as required. Use of a pressure washer may be required if substrate is extremely dirty. (Sufficient time must be allowed for the surface to thoroughly dry.)
- C. Install retaining edging or forms if required.
- 3.2 MIXING / APPLICATION Ó Pool deck / Splash pad Surface
 - A. Using a short nap roller, roll onto substrate surfaces one coat of primer at approximately 50 square feet per liter. Primer is not necessary if covering compacted stone. (two-tier system only)
 - B. The selected EPDM topcoat granules should be coated with aromatic or aliphatic resin in a non-porous container at a resin to granule ratio of 80% rubber to 20% urethane resin by weight. Topcoat should not be less than 6mm and not more than 12mm in depth. It is recommended that the mixing of the topcoat be carried out with an electric vertical shaft mortar mixer to ensure consistency and assuring complete coverage of each granule.
 - C. The resin should be applied to the rubber, once the rubber is initially working within the mixer. The above must be mixed for approximately 1-3 minutes.

3.3 HEALTH & SAFETY:

A. When using either resin or solvent products, whether during mixing or application, the wearing of protective gloves is essential. This will protect contact of the skin directly with the above materials. The gloves will be required to be changed regularly throughout the installation and sufficient quantities of same should be allowed for.

321816.14 - 4

- B. Should any resin or solvent come into contact with the skin, this must be immediately washed off using suitable detergents and water.
- C. When troweling the product, it is recommended that rubber kneepads with Velcro straps or knee boards be used.
- D. Read all Material Safety Data Sheets (MSDS) prior to installation. All relevant MSDS should be on site during installation.
- 3.4 SITE PROTECTION:
 - A. Erect barricades or caution tape as required preventing inadvertent pedestrian traffic on the finished floor surface for a period of 24-48 hours
 - B. On large projects where access to the public is possible, barricades and signs must be implemented around the working area, again to avoid any inadvertent traffic. This is more relevant on projects taking more than one day to complete.
- 3.5 CLEAN UP: Upon completion of work in the section, remove all tools, equipment, unused materials, and debris from the site; broom clean immediate area.

END OF SECTION 321816.14

SECTION 323119 - Egress Gate System – PreHung Gate

PART 1 - GENERAL

1.1 WORK INCLUDED

The contractor shall provide all labor, materials and appurtenances necessary for installation of the egress gate system defined herein at Boardwalk at Research Park.

1.2 RELATED WORK Section 31000 - Earthwork Section 03000 - Concrete Section 323119 - Fence & Gates

1.3 SYSTEM DESCRIPTION

The manufacturer shall supply a total egress gate system of the Ameristar®Exodus® (specify <u>Flange Mount, Surface Plate Mount or Direct Bury</u>) or Double Flange Mount installation method and (specify 1" picket w/ expanded metal, 1" picket w/ perforated metal, Pale w/ expanded <u>metal, pale w/ perforated metal, anti-scale pale w/ expanded metal, anti-scale pale w/</u> <u>perforated metal, perforated metal only, or expanded metal only</u>) infill. The system shall include all components (i.e., gate, jamb frame, infill, mullion for Exodus Double and hardware) required.

1.4 QUALITY ASSURANCE

Pre-hung gate system produced by a manufacturer with minimum 10 years experience in gate manufacturing. The contractor shall provide laborers and supervisors who are thoroughly familiar with the type of construction involved and materials and techniques specified.

1.5 REFERENCES

ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.

ASTM B117 - Practice for Operating Salt-Spray (Fog) Apparatus.

ASTM D523 - Test Method for Specular Gloss.

ASTM D714 - Test Method for Evaluating Degree of Blistering in Paint.

ASTM D822 - Practice for Conducting Tests on Paint and Related Coatings and Materials using Filtered Open-Flame Carbon-Arc Light and Water Exposure Apparatus.

ASTM D1654 - Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments.

ASTM D2244 - Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.

ASTM D2794 - Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).

ASTM D3359 - Test Method for Measuring Adhesion by Tape Test.

ASTM F2408 – Ornamental Fences Employing Galvanized Steel Tubular Pickets.

IBC Group I-2 Egress Requirements

1.6 1.06 SUBMITTAL

The manufacturer's submittal package shall be provided prior to installation.

1.7 PRODUCT HANDLING AND STORAGE

Upon receipt at the job site, all materials shall be checked to ensure that no damages occurred during shipping or handling. Materials shall be stored in such a manner to ensure proper ventilation and drainage, and to protect against damage, weather, vandalism, and theft. 1.08 PRODUCT WARRANTY

Gate system (i.e. gate, jamb frame, and infill) shall be warranted within specified limitations, by the manufacturer for a period of three (3) years from date of original purchase. Warranty shall cover any defects in workmanship and material finish, including cracking, peeling, chipping, blistering, or corroding. See full product warranty online or request from Ameristar.

PART 2 - PART 2 - MATERIALS

2.1 MANUFACTURER

The gate system shall conform to the Ameristar Exodus Egress Gate (<u>specify Flange Mount,</u> <u>Surface Plate Mount or Direct Bury</u>) or Double Flange Mount installation method and (<u>specify 1"</u> <u>picket w/ expanded metal, 1" picket w/ perforated metal, Pale w/ expanded metal, pale w/</u> <u>perforated metal, anti-scale pale w/ expanded metal, anti-scale pale w/ perforated metal,</u> <u>perforated metal only, or expanded metal only</u>) infill, manufactured by Ameristar Perimeter Security in Tulsa, Oklahoma.

2.2 MATERIAL

A. Steel material for gate framework (i.e. jamb frame & gate), shall be galvanized prior to forming in accordance with the requirements of ASTM A653/A653M, with minimum yield strength of 45,000 psi (310 MPa). The steel shall be hot-dip galvanized to meet the requirements of ASTM A653/A653M with a minimum zinc coating weight of 0.90 oz/ft² (276 g/m²), Coating Designation G-90.

B. Infill frame shall be 12ga steel. Expanded metal mesh shall be $\frac{34}{2}$ x #9 flattened or Perforated metal mesh shall be $\frac{3}{16}$ round x $\frac{1}{2}$ x 18ga.

C. Ornamental picket infill material shall consist of 1" square x 14 Ga. tubing for pickets. Pickets shall be spaced no greater than 5" o.c. Infill frame shall be 12ga steel. Expanded metal mesh shall be ¾" x #9 flattened or Perforated metal mesh shall be 3/16" round x ½" x 18ga. D. If applicable - material for pales shall be 2.75" x .75" x 14ga. corrugated shape. Standard pale spacing shall be no greater than 6" o c. or anti-scale pale spacing at no greater than 4.25".

pale spacing shall be no greater than 6" o.c. or anti-scale pale spacing at no greater than 4.25" o.c.

E. Gate shall be 1.75" x 14ga steel reinforced structural design with ¼" plate reinforced hinge mounting.

F. Hinges shall be stainless steel five knuckle bearing hinges with non-removable pin and stainless steel fasteners.

G. Removable mullion (Exodus Double only) shall be L980 Lockable Mullion.

2.3 FABRICATION

A. Gate shall be pre-drilled to accept appropriate hardware set. Infill frames shall be fabricated as a single unit. Frame shall be of welded construction inset with mesh filler, attachment to gate frame by means of security fasteners.

B. Gate jamb frame shall be fully welded consisting of 3" x 12ga square tubing for main jamb, 1" square gate stop, and strike mounting block, with gate stop bumpers. Jamb to include an electrical access point with conduit point of connection. Electrical connection to gate by means of Power Transfer connection mounted in jamb and gate. Gate shall be pre-assembled.

C. Gate threshold to be mounted with fasteners allowing for placement below grade or removal after gate installation.

D. Gate shall have clear opening (from gate stop to face of gate open to 90 degrees) of 41.5" meeting IBC Group I-2 Egress requirements.

E. Gate hardware to consist of exterior rated devices. Gate and hardware to be pre-assembled prior to shipping.

F. The manufactured galvanized gate shall be subjected to a multi-stage pretreatment/wash, followed by a dual stage coating process consisting of a cathodic electro-coat epoxy primer base coat and an electrostatic spray topcoat application, a PermaCoat®powder coat system.

Steel framework is subjected to a six-stage pretreatment/wash followed by an electrostatic spray application of PermaCoat Color System, a two-coat powder system. The base coat is a thermosetting epoxy powder coating (gray in color). The top coat is a "no-mar" TGIC polyester powder coat finish with a minimum thickness of 2 mils (0.0508mm). The stratification-coated framework shall be capable of meeting the performance requirements for each quality characteristic shown in Table 2.

PART 3 - PART 3 - EXECUTION

3.1 PREPARATION

All new installation shall be laid out by the contractor in accordance with the construction plans.

3.2 GATE INSTALLATION

Post installation for flange mount systems shall be spaced according Table 1. Posts set in concrete footers shall have a minimum depth of 36" (Note: In some cases, local restrictions of freezing weather conditions may require a greater depth). The "Earthwork" and "Concrete" sections of this specification shall govern material requirements for the concrete footer. Posts setting by other methods such as flanged, plated posts or grouted core-drilled footers are permissible only if shown by engineering analysis to be sufficient in strength for the intended application.

3.03 GATE INSTALLATION MAINTENANCE

When cutting/drilling gate components or posts adhere to the following steps to seal the exposed steel surfaces; 1) Remove all metal shavings from cut area. 2) Apply zinc-rich primer to thoroughly cover cut edge and/or drilled hole; let dry. 3) Apply 2 coats of custom finish paint matching fence color. Failure to seal exposed surfaces per steps 1-3 above will negate warranty. Ameristar spray cans or paint pens shall be used to prime and finish exposed surfaces; it is recommended that paint pens be used to prevent overspray. Use of non-Ameristar parts or components will negate the manufactures' warranty. 3.05 CLEANING

The contractor shall clean the jobsite of excess materials; post-hole excavations shall be scattered uniformly away from posts.

almonny away non posts.								
Table 1 – Exodus Egress Gate – Flange Mounting Option								
Post Type		Square						
Post Size		2.5 "	3"	4"	6"		8"	
Post Setting On Center - single		58.5"/	59"/104"	60" / 105"	62" / 107" 64"		64" / 109"	
/ double		103.5"						
Inside Post Spacing - single / double		56" / 101"	56"/101"	56"/101"	56"/101" 56"/101		56" / 101"	
Post Type		I-Beam						
Post Size		3"				4"		
Post Setting On Center - single		60.25" / 105"				60.25" / 105"		
/ double								
Inside Post Spacing - single /		58 75" / 102	25"	58 75" / 102 25"				
double		30.73 7 102.23				30.73 7 102.23		
Table 2 – Coating Performance Requirements								
Quality ASTM Tes		st Method		Performance Requirements				
<u>Characteristics</u>								
Adhesion	D3359 –	Method B		Adhesion (Retention of Coating) over 90% of test area				
				(Tape and knife test).				
Corrosion Resistance B117, D71		4 & D1654		Corrosion Resistance over 3,500 hours (Scribed per D1654;				
			f	ailure mode is a	accumulation o	of 1/8" coating	loss from	
			S	cribe or mediu	m #8 blisters).			
Impact Resistance D2794				Impact Resistance over 60 inch lb. (Forward impact using				

		0.625" ball).
Weathering	D822 D2244, D523 (60°	
Resistance	Method)	
		Weathering Resistance over 1,000 hours (Failure mode
		is 60% loss of gloss or color variance of more than 3
		delta-E color units).

SECTION 323300 - SITE FURNISHINGS

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. Seating.
 - 2. Tables.
 - 3. Bicycle racks.
 - 4. Fire pits
 - 5. Umbrellas

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For site furnishings to include in maintenance manuals.

PART 2 - PRODUCTS

2.1 SEATING

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. Landscape Forms.
 - 2. Tropitone
 - 3. Fermob
 - 4. Loll
 - 5. Sika Design
- B. Seat[and Back]:
 - 1. Seating Configuration: Multiple units[as indicated].

2.2 TABLES

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. Fermob.
- B. [Fiberglass] [HDPE] Color: [As indicated by manufacturer's designation] [Match Architect's samples] [As selected by Architect from manufacturer's full range] [As indicated in a site furnishing schedule] <Insert description>.
- C. Graphics: [Surface-applied] [Engraved] [Attached brass plaque with engraved] copy, content, and style [per manufacturer's standard] [as indicated on Drawings].

2.3 BICYCLE RACKS

- A. Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
- B. Aluminum Finish: [Mill finish] [Color coated].
 - 1. Color: [As indicated by manufacturer's designation] [Match Architect's samples] [As selected by Architect from manufacturer's full range] [As indicated in a site furnishing schedule] < Insert description >.
- C. Steel Finish: [Galvanized] [Color coated].
 - 1. Color: [As indicated by manufacturer's designation] [Match Architect's samples] [As selected by Architect from manufacturer's full range] [As indicated in a site furnishing schedule] < Insert color>.
- D. Stainless Steel Finish: [ASTM A480/A480M, No. 4] <Insert description>.
- E. Wood Finish: [Unfinished] [Manufacturer's standard finish].

2.4 MATERIALS

- A. Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated; free of surface blemishes and complying with the following:
 - 1. Rolled or Cold-Finished Bars, Rods, and Wire: ASTM B211.
 - 2. Extruded Bars, Rods, Wire, Profiles, and Tubes: ASTM B221.
 - 3. Structural Pipe and Tube: ASTM B429/B429M.
 - 4. Sheet and Plate: ASTM B209.
 - 5. Castings: ASTM B26/B26M.

- B. Steel and Iron: Free of surface blemishes and complying with the following:
 - 1. Plates, Shapes, and Bars: ASTM A36/A36M.
 - 2. Steel Pipe: Standard-weight steel pipe complying with ASTM A53/A53M, or electric-resistance-welded pipe complying with ASTM A135/A135M.
 - 3. Tubing: Cold-formed steel tubing complying with ASTM A500/A500M.
 - 4. Mechanical Tubing: Cold-rolled, electric-resistance-welded carbon or alloy steel tubing complying with ASTM A513/A513M, or steel tubing fabricated from steel complying with ASTM A1011/A1011M and complying with dimensional tolerances in ASTM A500/A500M; zinc coated internally and externally.
 - 5. Sheet: Commercial steel sheet complying with ASTM A1011/A1011M.
 - 6. Perforated Metal: From steel sheet not less than [0.075-inch] [0.090-inch] [0.120-inch] <a> <a> <a> <a> <a> <a>
 - 7. Expanded Metal: Carbon-steel sheets, deburred after expansion, and complying with ASTM F1267.
 - 8. Malleable-Iron Castings: ASTM A47/A47M, grade as recommended by fabricator for type of use intended.
 - 9. Gray-Iron Castings: ASTM A48/A48M, Class 200.
- C. Stainless Steel: Free of surface blemishes and complying with the following:
 - 1. Sheet, Strip, Plate, and Flat Bars: ASTM A240/A240M or ASTM A666.
 - 2. Pipe: Schedule 40 steel pipe complying with ASTM A312/A312M.
 - 3. Tubing: ASTM A554.
- D. Wood: Surfaced smooth on four sides with eased edges; kiln dried, free of knots, solid stock of species indicated.
 - 1. Wood Species: [Manufacturer's standard.]
 - a. Douglas Fir: Clear Grade, vertical grain.
 - b. Pine: Southern pine; No. 2 or better[; preservative treated, kiln dried after treatment].
 - c. [Eastern White] [Red] [Yellow] Cedar: Select Grade or better.
 - d. Redwood: [Clear all heart] [Construction heart or better], free-of-heart center.
 - e. Teak (Tectona Grandis): Clear Grade.
 - f. <Insert wood species>: <Insert grade, if applicable, and other requirements>.
- E. Fiberglass: 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.
- F. Plastic: Color impregnated, color and UV-light stabilized, and mold resistant.
 - 1. Polyethylene: Fabricated from virgin plastic HDPE resin.
 - 2. Polyethylene with Recycled Content: Fabricated from HDPE and other resins with postconsumer recycled content plus one-half of preconsumer recycled content not less than <Insert number> percent.

- G. Anchors, Fasteners, Fittings, and Hardware: [Stainless steel] [Brass] [Galvanized steel] [Zinc-plated steel] [Manufacturer's standard, corrosion-resistant-coated or noncorrodible materials]; commercial quality[, tamperproof, vandal and theft resistant] [, concealed, recessed, and capped or plugged].
 - 1. Angle Anchors: For inconspicuously bolting legs of site furnishings to [on] [below]-grade substrate; [one per leg] [extent as indicated] <Insert extent>.
 - 2. Antitheft Hold-Down Brackets: For securing site furnishings to substrate; [two per unit] [extent as indicated on Drawings] <Insert extent>.
- H. Galvanizing: Where indicated for steel and iron components, provide the following protective zinc coating applied to components after fabrication:
 - 1. Zinc-Coated Tubing: External, zinc with organic overcoat, consisting of a minimum of 0.9 oz./sq. ft. of zinc after welding, a chromate conversion coating, and a clear, polymer film. Internal, same as external or consisting of 81 percent zinc pigmented coating, not less than 0.3 mil thick.
 - 2. Hot-Dip Galvanizing: According to ASTM A123/A123M, ASTM A153/A153M, or ASTM A924/A924M.

2.5 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. Preservative Treatment: Pressure-treat wood according to AWPA U1, Use Category UC3b, and the following:
 - 1. Use preservative chemicals acceptable to authorities having jurisdiction and containing no arsenic or chromium. Use chemical formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants to distinguish treated materials from untreated materials.
 - 2. Kiln-dry lumber and plywood after treatment to a maximum moisture content, respectively, of 19 and 15 percent. Do not use materials that are warped or do not comply with requirements for untreated materials.

2.6 FABRICATION

- A. Metal Components: Form to required shapes and sizes with true, consistent curves, lines, and angles. Separate metals from dissimilar materials to prevent electrolytic action.
- B. Welded Connections: Weld connections continuously. Weld solid members with full-length, full-penetration welds and hollow members with full-circumference welds. At exposed connections, finish surfaces smooth and blended, so no roughness or unevenness shows after finishing and welded surface matches contours of adjoining surfaces.

- C. Pipes and Tubes: Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of handrail and railing components.
- D. Preservative-Treated Wood Components: Complete fabrication of treated items before treatment if possible. If cut after treatment, apply field treatment complying with AWPA M4 to cut surfaces.
- E. Exposed Surfaces: Polished, sanded, or otherwise finished; all surfaces smooth, free of burrs, barbs, splinters, and sharpness; all edges and ends rolled, rounded, or capped.
- F. Factory Assembly: Factory assemble components to greatest extent possible to minimize field assembly. Clearly mark units for assembly in the field.

2.7 GENERAL FINISH REQUIREMENTS

A. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.8 ALUMINUM FINISHES

A. Powder-Coat Finish: Manufacturer's standard polyester powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.

2.9 STEEL AND GALVANIZED-STEEL FINISHES

- A. Powder-Coat Finish: Manufacturer's standard polyester, powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.
- B. PVC Finish: Manufacturer's standard, UV-light stabilized, mold-resistant, slip-resistant, matte-textured, dipped or sprayed-on, PVC-plastisol finish, with flame retardant added; complying with coating manufacturer's written instructions for pretreatment, application, and minimum dry film thickness.

2.10 IRON FINISHES

A. Powder-Coat Finish: Manufacturer's standard polyester powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.

2.11 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 directional finishes with long dimension of each piece.
 - 2. Directional Satin Finish: ASTM A480/A480M, No 4.
 - 3. Dull Satin Finish: ASTM A480/A480M, No. 6.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

- A. Comply with manufacturer's written installation instructions unless more stringent requirements are indicated. Complete field assembly of site furnishings where required.
- B. Unless otherwise indicated, install site furnishings after landscaping and paving have been completed.
- C. Install site furnishings level, plumb, true, and [securely anchored] [positioned] at locations indicated on Drawings.
- D. Post Setting: Set cast-in support posts in concrete footing with smooth top, shaped to shed water. Protect portion of posts above footing from concrete splatter. Verify that posts are set plumb or at correct angle and are aligned and at correct height and spacing. Hold posts in position during placement and finishing operations until concrete is sufficiently cured.
- E. Posts Set into Voids in Concrete: Form or core-drill holes for installing posts in concrete to depth recommended in writing by manufacturer of site furnishings and 3/4 inch larger than OD of post. Clean holes of loose material, insert posts, and fill annular space between post and concrete with , mixed and placed to comply with anchoring material manufacturer's written instructions, with top smoothed and shaped to shed water.

END OF SECTION 323300

SECTION 328400 - PLANTING IRRIGATION

1.1 PERFORMANCE REQUIREMENTS

- A. Irrigation zone control shall be automatic operation with controller and automatic control valves.
- B. Minimum Working Pressures:
 - 1. Irrigation Main Piping: 200 psig Insert value.
 - 2. Circuit Piping: 150 psig Insert value.

1.2 ABOVEGROUND IRRIGATION MAIN PIPING

- A. Pipe NPS 4 and Smaller:
 - 1. Galvanized-steel pipe, galvanized fittings, and threaded joints.
 - 2. Type L hard copper tube, wrought- or cast-copper fittings, and brazed joints.
 - 3. Schedule 40, PVC pipe; socket-type PVC fittings; and solvent-cemented joints.
 - 4. Schedule 80, PVC pipe; Schedule 80, threaded PVC fittings; and threaded joints.
- B. Pipe NPS 5 and Larger:
 - 1. Galvanized-steel pipe, galvanized fittings, and threaded joints.
 - 2. Schedule 40, PVC pipe and socket fittings; and solvent-cemented joints.
 - 3. Schedule 80, PVC pipe; Schedule 80, threaded PVC fittings; and threaded joints.

1.3 UNDERGROUND IRRIGATION MAIN PIPING

- A. Pipe NPS 4 and Smaller:
 - 1. NPS 3 and NPS 4 ductile-iron, mechanical-joint pipe and fittings; and gasketed joints.
 - 2. NPS 3 and NPS 4 ductile-iron, push-on-joint pipe and fittings; and gasketed joints.
 - 3. Type L soft copper tube, wrought-copper fittings, and brazed joints.
 - 4. NPS 4 PE pressure pipe; PE butt, heat-fusion or socket-type fittings; and heat-fusion joints.
 - 5. Schedule 40, PVC pipe and socket fittings, and solvent-cemented joints.
 - 6. Schedule 80, PVC pipe; Schedule 80, PVC fittings; and threaded joints.
 - 7. SDR 21, PVC, pressure-rated pipe; Schedule 80, PVC socket fittings; and solvent-cemented joints.
- B. Pipe NPS 5 and Larger:
 - 1. NPS 6 and larger ductile-iron, mechanical-joint pipe and fittings; and gasketed joints.

- 2. NPS 6 and larger ductile-iron, push-on-joint pipe and fittings; and gasketed joints.
- 3. PE pressure pipe; PE butt, heat-fusion fittings; and heat-fusion joints.
- 4. Schedule 40, PVC pipe and socket fittings; and solvent-cemented joints.
- 5. SDR 21, PVC, pressure-rated pipe; Schedule 80, PVC socket fittings; and solvent-cemented joints.
- 1.4 CIRCUIT PIPING
 - A. Pipe NPS 2 and Smaller:
 - 1. SIDR 7, PE, controlled ID pipe; insert fittings; and fastener joints.
 - 2. DR 9, PE, controlled OD pipe; PE butt, heat-fusion, or socket-type fittings; and heat-fusion joints.
 - 3. Schedule 40, PVC pipe and socket fittings; and solvent-cemented joints.
 - 4. SDR 26, PVC, pressure-rated pipe; Schedule 40, PVC socket fittings; and solvent-cemented joints.
 - B. Pipe NPS 2-1/2 TO NPS 4:
 - 1. SIDR 7, PE, controlled ID pipe; insert fittings; and banded or fastener joints.
 - 2. DR 9, PE, controlled OD pipe; PE socket or butt-fusion fittings; and heat-fusion joints. NPS 3 pipe and fittings if NPS 2-1/2 pipe and fittings are not available.
 - 3. Schedule 40, PVC pipe and socket fittings; and solvent-cemented joints.
 - 4. SDR 26, PVC, pressure-rated pipe; Schedule 40, PVC socket fittings; and solvent-cemented joints.

1.5 RISERS TO ABOVEGROUND SPRINKLERS AND SPECIALTIES

- A. Type L hard copper tube, wrought-copper fittings, and brazedjoints.
- 1.6 DRAIN PIPING
 - A. SIDR 9, 11.5, or 15, PE, controlled ID pipe; insert fittings; and banded or fastener joints.
 - B. Schedule 40, PVC pipe and socket fittings; and solvent-cemented joints.
 - C. SDR 21, 26, or 32.5, PVC, pressure-rated pipe; Schedule 40, PVC socket fittings; and solvent-cemented joints.

1.7 ABOVEGROUND, SHUTOFF-DUTY VALVES

- A. NPS 2 and Smaller:
 - 1. Plastic ball valve.
 - 2. Bronze gate valve.
- B. NPS 2-1/2 and Larger:

- 1. Iron ball valve.
- 2. Iron gate valve, NRS.

1.8 THROTTLING-DUTY VALVES

- A. NPS 2 and Smaller:
 - 1. Plastic automatic control valve.
 - 2. Plastic ball valve.
- B. NPS 2-1/2 and NPS 3:
 - 1. Plastic automatic control valve.
 - 2. Iron ball valve.

1.9 DRAIN VALVES

- A. NPS 1/2 and NPS 3/4: Plastic ball valve.
- B. NPS 1 to NPS 2: Plastic ball valve.

1.10 MANUFACTURED UNITS

- A. Automatic Control Valves: Plastic.
- B. Exposed, Impact-Drive Rotary Sprinklers: Plastic.
- C. Pop-up, Impact-Drive Rotary Sprinklers: Plastic.
- D. Surface Spray Sprinklers: Plastic.
- E. Surface, Pop-up Spray Sprinklers: Plastic.
- F. Boxes for Automatic Control Valves: Plastic.

END OF SECTION 328400

SECTION 329200 - LAWNS AND GRASSES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide all equipment, materials, labor, and services required to establish a permanent vegetative cover for lawns over all areas disturbed or altered by construction.

1.2 SUBMITTALS

- A. Product Data: Submittals on seed and fertilizer shall include a test report from the Alabama Department of Agriculture and Industries or a comparable testing lab. The test report shall bear the specific lot number of the product as well as the date sampled, the purity, and germination, the percent weed seed, the analysis, date tested as well as other pertinent data about the product.
- B. Guarantee: Written guarantee for a period of one growing season (minimum six months). Replacement shall be at no cost to the Owner.

1.3 REFERENCES

A. The materials and method of construction for protective covering and erosion control shall be in accordance with the latest revisions of the Alabama Department of Transportation (ALDOT) Standards, the Road and Bridge Specifications.

1.4 JOB CONDITIONS

- A. Topsoil shall be stockpiled, on the project site, for reuse on all disturbed areas in the grading and landscape work.
- B. Seeding shall begin immediately after final grading is completed in the area to be seeded.
- C. Seeding shall only be performed between March 1 and May 31 or between August 15 and September 30. At other times, seeding with annual rye for temporary cover shall be made until the desired spring or later summer seeding time.
- D. Seeding shall not be performed on frozen or muddy grounds or when prevailing winds exceed five (5) miles per hour.

PART 2 - PRODUCTS

2.1 GENERAL

A. Materials shall be delivered in unbroken containers, clearly marked by the manufacturer as to contents. Limes, Fertilizer and Seed shall be labeled as to proportions, analysis and quality. Store all materials in a manner affording protection from damage by weather or vandalism.

2.2 LIME

A. Lime shall be ground or pulverized agricultural grade limestone containing not less than 85 percent total carbonates and shall be ground to such fineness that at least 50% will pass a 100 mesh sieve and at least 90% will pass a 20 mesh sieve.

2.3 2.3 FERTILIZER

A. The fertilizer shall be an agricultural grade 10-20-10 or any equivalent 1-2-1 ratio fertilizer. Fertilizer shall be commercial/agricultural grade, free flowing, uniform in composition, and shall conform to State and Federal regulations. Fertilizer shall bear the manufacturer's guaranteed statement of analysis.

2.4 SEED

- A. Grass seed for lawns and open fields shall be as specified on the drawings.
- B. Grass seed shall be clean, fresh stock, and labeled in accordance with the Federal Seed Act and shall be produced by a recognized manufacturer and guaranteed by the dealer. The seed shall have the State of Alabama certification.

2.5 MULCH

- A. Mulch shall be straw or grain mulch as described, or wood cellulose fiber.
- B. Straw mulch shall be from oats, wheat, and/or barley and shall be free of noxious weeds and noxious weed seeds. The straw will not contain sticks, rocks, or other objectionable material and will not be wet, moldy, or otherwise undesirable.
- C. Wood cellulose fiber used for hydraulic mulching shall consist of specially manufactured commercially available products containing wood cellulose fiber, recycled newsprint fibers, or a combination of these materials. The wood cellulose fiber or newsprint fiber will contain no growth or germination inhibiting factor and shall contain a dye for color. The dye shall allow the operator to monitor the amount of mulch being applied to the area to insure proper coverage.

PART 3 - EXECUTION

3.1 SUBGRADE PREPARATION

- A. All subgrade for finished lawn areas and drainage channels shall be raked to remove all debris and stones over two (2) inches in diameter. All subgrade for open field areas and shoulders shall be raked to remove all debris and stone over three (3) inches in diameter.
- B. Prior to spreading topsoil, the subgrade shall be loosened to a minimum of four (4) inches by tilling, disking or harrowing.

3.2 TOPSOIL PREPARATION

- A. Topsoil shall be spread over the prepared subgrade in all lawn areas to a minimum depth of four (4) inches. Bond topsoil to subgrade by tilling, disking, or harrowing. Topsoil shall not be spread over the subgrade when either the topsoil or subgrade is frozen or excessively wet.
- B. Where topsoil is not applied, the surface of finished grade shall also be prepared as specified for topsoil hereinafter.
- C. Prior to seeding finished lawn areas and drainage channels, topsoil surface shall be raked to remove all debris and stones over two (2) inches in diameter and to smooth any surface irregularities. Prior to seeding open field areas and shoulders, topsoil shall be raked to remove all debris and stones over three (3) inches in diameter and to smooth any surface irregularities.
- D. Topsoil finish grade of lawn areas and open fields shall be slightly higher than existing grade and rounded off to avoid abrupt changes in grade.

3.3 PREPARATION OF AREAS TO BE SEEDED

- A. Slopes 3:1 or steeper
 - 1. On slopes, use the walking or tracking method with a dozer or other tracked equipment. Vertically "walk" the slope so as to leave track marks perpendicular to the toe of the slope. Remove large rocks, stones and roots over two inches in diameter.
 - 2. Where this tracking of slope areas is not possible or practical, the use of a slope chain may be used to loosen the top two inches of soil for proper seedbed preparation. The chain shall be dragged across the top of the slope. The spikes on the chain shall produce puncture marks in the slope as well as serve to loosen the soil surface.
 - 3. Where the sloped areas are smoothly graded and are unable to be loosened satisfactorily for seedbed preparation, cutting horizontal grooves into the slope may be required with the use of grading equipment or by other means.

- 4. If the slope is freshly graded and the surface is friable without disturbing, the Contractor may be allowed to seed the slope without further slope preparation.
- B. B. Areas Flatter Than 3:1 and Playing Fields
 - 1. Use a disk or harrow to loosen the top 4 inches of soil. Where this is not possible backdrag the area with the toothed bucket or dozer type equipment to loosen the soil surface.
 - 2. Rake the area smooth and remove roots, rocks and other debris that may interfere with the seeding operation. Debris larger than two inches in diameter should be raked from the surface with the use of a York Rock Rake, hand rake, or other comparable equipment.
 - 3. In the final preparation of the surface, care should be taken to insure that low areas or depressions do not occur which could later cause ponding or settling out areas.
- C. C. Ditchlines, Waterways, Channel Change Areas
 - 1. Care should be taken to insure that a minimum of disturbance occurs in all areas that are to carry water through the site. Preparation for seeding in these areas consists of removing large stones, rocks, roots and other debris that may interfere with the germination of seed.
 - 2. In ditchlines that will receive erosion control treatment, the ditch shall be free of all obstructions that may prevent the erosion control from being attached securely and to the bottom and sides of the ditch.

3.4 LIME APPLICATION

- A. Lime shall be applied at the rate of 45 lb./1000 sq. ft.
- B. Lime may be applied with the use of a bulk spreader, drop type spreader, Hydroseeder or any other equipment approved for application by the Engineer. The application shall result in an even spreading of the lime over the entire area to be seeded.
- C. In areas 3:1 or flatter the lime shall be applied after the disking operation and before raking the soil. Lime shall be applied before any application of fertilizer except when the seeding equipment used is a hydroseeder. On slopes 3:1 or steeper or where a hydroseeder is used in the seeding operation, the application of lime can be made in connection with the fertilizer, seed, and mulch in the slurry mix in the hydroseeder.

3.5 FERTILIZER APPLICATION

- A. The rate of application shall be the equivalent of 25 lbs./1000 sq ft. except where otherwise directed.
- B. Fertilizer may be applied with the use of a bulk spreader, cyclone spreader, Hydroseeder, or other equipment approved for application by the Landscape Architect. The application shall result in an even spreading of the fertilizer over the entire area to be seeded.

- C. The Contractor shall take care as to not spill large amounts of the fertilizer in the areas to be seeded during the loading and spreading of fertilizer.
- D. The fertilizer shall be worked into the topsoil to a depth of 3 inches.

3.6 SEEDING

- A. Prior to seeding, scarify the topsoil surface with a rake to a minimum depth of 1/4 inch. The application of seed shall be by broadcast, cyclone type, drill type, hydroseeder, or other equipment approved for application by the Landscape Architect. The application of the seed over the area shall be even and at the rates specified.
- B. Sow Seed by Mechanical Seeder as Follows:
 - 1. Mix seed thoroughly with clean dry sawdust and broadcast at rate of 200 lbs. of seed per acre for permanent seeding or as specified elsewhere for temporary seeding.
 - 2. Apply mulch uniformly to depth of approximately 1-1/4 inches.
 - 3. Anchor mulch by the following methods:
 - 4. Apply light tack coat of asphalt emulsion or synthetic mulch binder.
 - 5. On slopes steeper than 3 horizontal to 1 vertical, anchor with EC-2 (jute mesh) matting fastened to wooden stakes.
- C. Sow Seed by Hydraulic Seeder as Follows:
- 3.7 Prepare homogeneous slurry equal to the seed mixture used for mechanic seeding as specified in this Section.
- 3.8 Distribute slurry uniformly at rate equal to the rate specified for mechanical seeding.
- 3.9 Apply mulch as specified for sowing by mechanical seeder.
 - A. The Contractor shall take great care to insure that the seed is not sown into areas that are to receive landscaping or other treatment such as asphalt and or concrete pavement. This includes bed areas, landscaped berms, parking and drive areas as well as sidewalks, etc.
 - B. After sowing, seed shall be rolled with a cultipacker and immediately mulched with straw or wood cellulose fiber.

3.10 MULCHING

A. Straw mulch will be applied at the rate of 45 lbs./1000 sq. ft. Wood cellulose fiber mulch shall be applied at the rate of 35 lbs. dry weight/1000 sq. ft.

- B. The application of straw mulch will be through a blower or other approved equipment capable of shredding the material from the bale and distributing it evenly over the seeded areas. The application of mulch will take place no more than 24 hours after the seeding operation of the area.
- C. The application of wood cellulose fiber mulch shall be in a slurry mix through a hydroseeder. The slurry mixture shall be constantly agitated from the initial mixing point until the material is discharged onto the ground. The material shall then be applied over the seeded area in a manner not disruptive to the placement of seed.
- D. The Contractor will take all necessary precautions to prevent the application of the wood cellulose fiber mulch, straw or binders onto landscaped areas, fixtures, fences and signs in the area to be mulched.

3.11 MULCH TACKIFIER

- A. Straw mulch will be tacked to the seeded area by the use of one of the following method: A crimping device may be used that will punch the straw into the soil to prevent wind disturbance. The use of a chemical binder manufactured for the purpose of securing mulch may also be used when applied with a hydroseeder. The use of wood cellulose is also allowed for tacking straw mulch.
- B. When a chemical binder is used, follow the manufacturer's recommendations as to the rates of material required. The Contractor may also elect the use of an application of wood cellulose fiber at the rate of 750 pounds to the acre as a tackifier in lieu of the above methods.
- C. The tacking or securing of the straw mulch shall be completed immediately after the mulching is complete.

3.12 PROTECTION AND MAINTENANCE OF SEEDED AREAS

- A. After the seeding is completed in a particular area, the area shall be protected from vehicular, and or foot traffic by erecting barricades, signs, ropes, or other such devices to prevent traffic where necessary.
- B. Surfaces gullied or otherwise damaged following seeding shall be repaired and re-graded as required and re-seeded as directed by the Landscape Architect .
- C. The maintenance period will extend through the time necessary to establish a healthy, uniform, two (2) inch high close stand of grass, free of weeds, bare spots, and surface irregularities.

3.13 ACCEPTANCE OF SEEDED AREAS

A. The acceptance of seeded areas shall be at the end of the establishment period mentioned above. Final acceptance shall be made when the specified vegetation is successfully established in the area to be accepted.
MasterSpec

END OF SECTION 329200

MasterSpec

SECTION 329300 - PLANTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Plants.
 - 2. Planting soils.

1.2 DEFINITIONS

- A. Backfill: The earth used to replace or the act of replacing earth in an excavation.
- B. Duff Layer: The surface layer of native topsoil that is composed of mostly decayed leaves, twigs, and detritus.
- C. Finish Grade: Elevation of finished surface of planting soil.
- D. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.
- E. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. It also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.
- F. Pests: Living organisms that occur where they are not desired, or that cause damage to plants, animals, or people. These include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.
- G. Planting Soil: Standardized topsoil; existing, native surface topsoil; existing, in-place surface soil; imported topsoil; or manufactured topsoil that is modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.
- H. Root Flare: Also called "trunk flare." The area at the base of the plant's stem or trunk where the stem or trunk broadens to form roots; the area of transition between the root system and the stem or trunk.
- I. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.
- J. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

MasterSpec

K. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil; but in disturbed areas such as urban environments, the surface soil can be subsoil.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated, including soils.
- B. Samples of mineral mulch.
- C. Product certificates.
- D. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of plants during a calendar year.

1.4 QUALITY ASSURANCE

- A. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
 - 1. Pesticide Applicator: State licensed, commercial.
- B. Soil Analysis: For each unamended soil type, furnish soil analysis and a written report by a qualified soil-testing laboratory.
 - 1. The soil-testing laboratory shall oversee soil sampling.
 - 2. Report suitability of tested soil for plant growth.
 - a. State recommendations for nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory planting soil suitable for healthy, viable plants.
 - b. Report presence of problem salts, minerals, or heavy metals; if present, provide additional recommendations for corrective action.
- C. Provide quality, size, genus, species, and variety of plants indicated, complying with applicable requirements in ANSI Z60.1.
- D. Preinstallation Conference: Conduct conference at jobsite.
- E. DELIVERY, STORAGE, AND HANDLING
- F. Deliver bare-root stock plants freshly dug. Immediately after digging up bare-root stock, pack root system in wet straw, hay, or other suitable material to keep root system moist until planting.
- G. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, wind burn, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of plants during shipping and delivery. Do not drop plants during delivery and handling.

- H. Handle planting stock by root ball.
- I. Store bulbs, corms, and tubers in a dry place at 60 to 65 deg F until planting.
- J. Deliver plants after preparations for planting have been completed, and install immediately. If planting is delayed more than six hours after delivery, set plants and trees in their appropriate aspect (sun, filtered sun, or shade), protect from weather and mechanical damage, and keep roots moist.

1.5 WARRANTY

- A. Special Warranty: Installer agrees to repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Death and unsatisfactory growth, except for defects resulting from abuse, lack of adequate maintenance, or neglect by Owner, or incidents that are beyond Contractor's control.
 - b. Structural failures including plantings falling or blowing over.
 - 2. Warranty Periods from Date of Substantial Completion:
 - a. Trees, Shrubs, Vines, and Ornamental Grasses: 12 months.
 - b. Ground Covers, Biennials, Perennials, and Other Plants: 12 months.
 - c. Annuals: Three months.

1.6 MAINTENANCE SERVICE

- A. Initial Maintenance Service: Provide maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established but for not less than maintenance period below.
 - 1. Maintenance Period for Trees and Shrubs: 12 months from date of Substantial Completion.
 - 2. Maintenance Period for Ground Cover and Other Plants: Six months from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PLANT MATERIAL

- A. General: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and other features indicated in Plant Schedule or Plant Legend shown on Drawings and complying with ANSI Z60.1; and with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock, densely foliated when in leaf and free of disease, pests, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.
- B. Root-Ball Depth: Furnish trees and shrubs with root balls measured from top of root ball, which shall begin at root flare according to ANSI Z60.1. Root flare shall be visible before planting.
- C. Annuals: Provide healthy, disease-free plants of species and variety shown or listed, with well-established root systems reaching to sides of the container to maintain a firm ball, but not with excessive root growth encircling the container. Provide only plants that are acclimated to outdoor conditions before delivery.

2.2 INORGANIC SOIL AMENDMENTS

- A. Lime: ASTM C 602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent and as follows:
 - 1. Class: T, with a minimum of 99 percent passing through No. 8 sieve and a minimum of 75 percent passing through No. 60 sieve.
- B. Sulfur: Granular, biodegradable, and containing a minimum of 90 percent sulfur, with a minimum of 99 percent passing through No. 6 sieve and a maximum of 10 percent passing through No. 40 sieve.
- C. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.
- D. Aluminum Sulfate: Commercial grade, unadulterated.
- E. Perlite: Horticultural perlite, soil amendment grade.
- F. Agricultural Gypsum: Minimum 90 percent calcium sulfate, finely ground with 90 percent passing through No. 50 sieve.
- G. Sand: Clean, washed, natural or manufactured, and free of toxic materials.

2.3 ORGANIC SOIL AMENDMENTS

- Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1-inch sieve; soluble salt content of 5 to 10 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:
- B. Sphagnum Peat: Partially decomposed sphagnum peat moss, finely divided or granular texture, with a pH range of 3.4 to 4.8.
- C. Muck Peat: Partially decomposed moss peat, native peat, or reed-sedge peat, finely divided or of granular texture, with a pH range of 6 to 7.5, and having a water-absorbing capacity of 1100 to 2000 percent.
- D. Wood Derivatives: Decomposed, nitrogen-treated sawdust, ground bark, or wood waste; of uniform texture and free of chips, stones, sticks, soil, or toxic materials.
- E. Manure: Well-rotted, unleached, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, debris, and material harmful to plant growth.

2.4 FERTILIZERS

- A. Bonemeal: Commercial, raw or steamed, finely ground; a minimum of 4 percent nitrogen and 15 percent phosphoric acid.
- B. Superphosphate: Commercial, phosphate mixture, soluble; a minimum of 20 percent available phosphoric acid.
- C. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
 - 1. Composition: 1 lb/1000 sq. ft.of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.
- D. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
 - 1. Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.

2.5 PLANTING SOILS

- A. Planting Soil ASTM D 5268 topsoil, with pH range of 5.5 to 7, a minimum of 2 percent organic material content. Verify suitability of soil to produce viable planting soil. Clean soil of roots, plants, sod, stones, clods, clay lumps, pockets of coarse sand, concrete slurry, concrete layers or chunks, cement, plaster, building debris, and other extraneous materials harmful to plant growth. Mix soil with the following soil amendments and fertilizers in the following quantities to produce planting soil:
 - 1. Ratio of Loose Compost to Topsoil by Volume: 1:4.
 - 2. Ratio of Loose Peat to Topsoil by Volume: 2:3.
 - 3. Weight of Lime per 1000 Sq. Ft.
 - 4. Weight of Agricultural Gypsum per 1000 Sq. Ft.
 - 5. Weight of Bonemeal per 1000 Sq. Ft: 18 lbs.
 - 6. Weight of Superphosphate per 1000 Sq. Ft.24 lbs.

2.6 MULCHES

- A. Organic Mulch: Shredded hardwood.
- 2.7 WEED-CONTROL BARRIERS
 - A. Nonwoven Geotextile Filter Fabric: Polypropylene or polyester fabric, 3 oz./sq. yd.minimum.

2.8 PESTICIDES

A. General: Pesticide registered and approved by EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.

PART 3 - EXECUTION

3.1 PLANTING AREA ESTABLISHMENT

- A. Loosen subgrade of planting areas to a minimum depth of 6 inches. Remove stones larger than 1 inch in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
 - 1. Apply fertilizer directly to subgrade before loosening.
- B. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

3.2 EXCAVATION FOR TREES AND SHRUBS

- A. Planting Pits and Trenches: Excavate circular planting pits with sides sloping inward at a 45-degree angle. Excavations with vertical sides are not acceptable. Trim perimeter of bottom leaving center area of bottom raised slightly to support root ball and assist in drainage away from center. Do not further disturb base. Ensure that root ball will sit on undisturbed base soil to prevent settling. Scarify sides of planting pit smeared or smoothed during excavation.
 - 1. Excavate approximately three times as wide as ball diameter.
 - 2. Excavate at least 12 incheswider than root spread and deep enough to accommodate vertical roots for bare-root stock.
- B. Subsoil and topsoil removed from excavations may not be used as planting soil.

3.3 TREE, SHRUB, AND VINE PLANTING

- A. Before planting, verify that root flare is visible at top of root ball according to ANSI Z60.1.
- B. Remove stem girdling roots and kinked roots. Remove injured roots by cutting cleanly; do not break.
- C. Set stock plumb and in center of planting pit or trench with root flare 1 inch above adjacent finish grades.
 - 1. Use planting soil for backfill.
 - 2. Balled and Burlapped: After placing some backfill around root ball to stabilize plant, carefully cut and remove burlap, rope, and wire baskets from tops of root balls and from sides, but do not remove from under root balls. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation.
 - 3. Container-Grown: Carefully remove root ball from container without damaging root ball or plant.
 - 4. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
 - 5. Continue backfilling process. Water again after placing and tamping final layer of soil.
- D. Bare-Root Stock: Set and support bare-root stock in center of planting pit or trench with root flare 1 inch above adjacent finish grade.
- E. When planting on slopes, set the plant so the root flare on the uphill side is flush with the surrounding soil on the slope; the edge of the root ball on the downhill side will be above the surrounding soil. Apply enough soil to cover the downhill side of the root ball.

3.4 TREE, SHRUB, AND VINE PRUNING

A. Prune, thin, and shape trees, shrubs, and vines according to standard professional horticultural and arboricultural practices. Unless otherwise indicated by Landscape Architect, do not cut tree leaders; remove only injured, dying, or dead branches from trees and shrubs; and prune to retain natural character.

3.5 GROUND COVER AND PLANT PLANTING

- A. Set out and space ground cover and plants other than trees, shrubs, and vines as indicated on drawings in even rows with triangular spacing.
- B. Use planting soil for backfill.
- C. Dig holes large enough to allow spreading of roots.
- D. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water.
- E. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.
- F. Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.

3.6 PLANTING AREA MULCHING

A. Mulch backfilled surfaces of planting areas and other areas indicated.

3.7 PLANT MAINTENANCE

- A. Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, mulching, restoring planting saucers, resetting to proper grades or vertical position, and performing other operations as required to establish healthy, viable plantings. Spray or treat as required to keep trees and shrubs free of insects and disease.
- B. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace mulch materials damaged or lost in areas of subsidence.
- C. Apply treatments as required to keep plant materials, planted areas, and soils free of pests and pathogens or disease. Use practices to minimize the use of pesticides and reduce hazards.
- D. Apply pesticides and other chemical products and biological control agents in accordance with authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.

E. Protect plants from damage due to landscape operations and operations of other contractors and trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.

END OF SECTION 329300

SECTION 334600 - SUBDRAINAGE

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. Perforated-wall pipe and fittings.
 - 2. Drainage conduits.
 - 3. Drainage panels.
 - 4. Geotextile filter fabrics.

1.3 ACTION SUBMITTALS

- A. Product Data:
 - 1. Drainage conduits, including rated capacities.
 - 2. Drainage panels, including rated capacities.
 - 3. Geotextile filter fabrics.

PART 2 - PRODUCTS

2.1 PERFORATED-WALL PIPES AND FITTINGS

- A. Perforated PE Pipe and Fittings:
 - 1. NPS 6 and Smaller: ASTM F405 or AASHTO M 252, Type CP; corrugated, for coupled joints.
 - 2. NPS 8 and Larger: ASTM F667; AASHTO M 252, Type CP; or AASHTO M 294, Type CP; corrugated; for coupled joints.
 - 3. Couplings: Manufacturer's standard, band type.
- B. Perforated PVC Sewer Pipe and Fittings: ASTM D2729, bell-and-spigot ends, for loose joints.

2.2 DRAINAGE CONDUITS

- A. Molded-Sheet Drainage Conduits: Prefabricated geocomposite with cuspated, molded-plastic drainage core wrapped in geotextile filter fabric.
 - 1. Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. Airfield Systems, LLC.
 - b. American Wick Drain.
 - c. JDR Enterprises, Inc.
 - d. MAPEI Corporation.
 - e. TenCate Geosynthetics.
 - f. Insert manufacturer's name.
 - 2. Nominal Size: 12 inches high by approximately 1 inch thick.
 - a. Minimum In-Plane Flow: 30 gpm Insert value at hydraulic gradient of 1.0 Insert value when tested according to ASTM D4716.
 - 3. Nominal Size: 18 inches high by approximately 1 inch thick.
 - a. Minimum In-Plane Flow: 45 gpm Insert value at hydraulic gradient of 1.0 Insert value when tested according to ASTM D4716.
 - 4. Filter Fabric: PP geotextile.
 - 5. Fittings: HDPE with combination NPS 4 and NPS 6 outlet connection.
- B. Multipipe Drainage Conduits: Prefabricated geocomposite with interconnected, corrugated, perforated-pipe core molded from HDPE complying with ASTM D1248 and wrapped in geotextile filter fabric.
 - 1. Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. Varicore Technologies, Inc.
 - b. Insert manufacturer's name.
 - 2. Nominal Size: 6 inches high by approximately 1-1/4 inches thick.
 - a. Minimum In-Plane Flow: 15 gpm at hydraulic gradient of 1.0 Insert value when tested according to ASTM D4716.
 - 3. Nominal Size: 12 inches high by approximately 1-1/4 inches thick.
 - a. Minimum In-Plane Flow: 30 gpm at hydraulic gradient of 1.0 when tested according to ASTM D4716.

- 4. Nominal Size: 18 inches high by approximately 1-1/4 inches thick.
 - a. Minimum In-Plane Flow: 45 gpm at hydraulic gradient of 1.0 Insert value when tested according to ASTM D4716.
- 5. Filter Fabric: Nonwoven, needle-punched geotextile.
- 6. Fittings: HDPE with combination NPS 4 and NPS 6 outlet connection.
- 7. Couplings: HDPE.
- C. Single-Pipe Drainage Conduits: Prefabricated geocomposite with perforated corrugated core molded from HDPE complying with ASTM D3350 and wrapped in geotextile filter fabric.
 - 1. Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. Advanced Drainage Systems, Inc.
 - b. Insert manufacturer's name.
 - 2. Nominal Size: 12 inches high by approximately 1 inch thick.
 - a. Minimum In-Plane Flow: 30 gpm at hydraulic gradient of 1.0 Insert value when tested according to ASTM D4716.
 - 3. Nominal Size: 18 inches high by approximately 1 inch thick.
 - a. Minimum In-Plane Flow: 45 gpm at hydraulic gradient of 1.0 Insert value when tested according to ASTM D4716.
 - 4. Filter Fabric: PP geotextile.
 - 5. Fittings: HDPE with combination NPS 4 and NPS 6 outlet connection.
 - 6. Couplings: Corrugated HDPE band.
- D. Mesh Fabric Drainage Conduits: Prefabricated geocomposite with plastic-filament drainage core wrapped in geotextile filter fabric. Include fittings for bends and connection to drainage piping.
 - 1. Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. Bonar Inc.; a Low & Bonar company.
 - b. Insert manufacturer's name.
 - 2. Nominal Size: 6 inches high by approximately 0.9 inch thick.
 - a. Minimum In-Plane Flow: 2.4 gpm at hydraulic gradient of 1.0 Insert value when tested according to ASTM D4716.

- 3. Filter Fabric: Nonwoven geotextile made of PP or polyester fibers or combination of both. Flow rates range from 120 to 200 gpm/sq. ft. when tested according to ASTM D4491.
- E. Ring Fabric Drainage Conduits: Drainage conduit with HDPE rings-in-grid pattern drainage core, for field-applied geotextile filter fabric. Include fittings for bends and connection to drainage piping.
 - 1. Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. Invisible Structures, Inc.
 - b. Insert manufacturer's name.
 - 2. Nominal Size: 18 inches high by 1 inch thick.
 - a. Minimum In-Plane Flow: 82 gpm at hydraulic gradient of 1.0 Insert value when tested according to ASTM D4716.
 - 3. Nominal Size: 36 inches high by 1 inch thick.
 - a. Minimum In-Plane Flow: 164 gpm at hydraulic gradient of 1.0 Insert value when tested according to ASTM D4716.
 - 4. Filter Fabric: Comply with requirements for flat geotextile filter fabric specified in Part 2 "Geotextile Filter Fabrics" Article.

2.3 DRAINAGE PANELS

- A. Molded-Sheet Drainage Panels: Prefabricated geocomposite, 36 to 60 inches wide with drainage core faced with geotextile filter fabric.
 - 1. Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. American Wick Drain.
 - b. Dorken Systems Inc.
 - c. Eljen Corporation.
 - d. JDR Enterprises, Inc.
 - e. MAPEI Corporation.
 - f. Mar-flex Waterproofing & Building Products.
 - g. Midwest Diversified Technologies Incorporated.
 - h. Sika Greenstreak.
 - i. TenCate Geosynthetics.
 - j. Trace-LINQ Inc.
 - k. Insert manufacturer's name.

- 2. Drainage Core: Three-dimensional, nonbiodegradable, molded PP.
 - a. Minimum Compressive Strength: 10,000 lbf/sq. ft. 15,000 lbf/sq. ft. 18,000 lbf/sq. ft. 21,000 lbf/sq. ft. when tested according to ASTM D1621.
 - b. Minimum In-Plane Flow Rate: 2.8 gpm/ft. 7 gpm/ft. 15 gpm/ft. Insert value of unit width at hydraulic gradient of 1.0 Insert value and compressive stress of 25 psig Insert value when tested according to ASTM D4716.
- 3. Filter Fabric: Nonwoven needle-punched geotextile, manufactured for subsurface drainage, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with the following properties determined according to AASHTO M 288:
 - a. Survivability: Class 1 Class 2 Class 3.
 - b. Apparent Opening Size: No. 40 No. 60 No. 70 sieve, maximum.
 - c. Permittivity: 0.5 0.2 0.1 per second, minimum.
- 4. Filter Fabric: Woven geotextile fabric, manufactured for subsurface drainage, made from polyolefins or polyesters; with elongation less than 50 percent; complying with the following properties determined according to AASHTO M 288:
 - a. Survivability: Class 1 Class 2 Class 3.
 - b. Apparent Opening Size: No. 40 No. 60 No. 70 No. 30 sieve, maximum.
 - c. Permittivity: 0.5 0.2 0.1 0.02 per second, minimum.
- 5. Film Backing: Polymeric film bonded to drainage core surface.
- B. Mesh Fabric Drainage Panels: Prefabricated geocomposite with drainage core faced with geotextile filter fabric.
 - 1. Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. Bonar Inc.; a Low & Bonar company.
 - b. Insert manufacturer's name.
 - 2. Drainage Core: Open-construction, resilient, plastic-filament mesh, approximately 0.4 inches thick.
 - a. Minimum In-Plane Flow Rate: 2.4 gpm/ft. of unit width at hydraulic gradient of 1.0 Insert value and normal pressure of 25 psig when tested according to ASTM D4716.
 - 3. Filter Fabric: Nonwoven geotextile of PP or polyester fibers or combination of both. Flow rates range from 120 to 200 gpm/sq. ft. when tested according to ASTM D4491.

- C. Net Fabric Drainage Panels: Prefabricated geocomposite with drainage core faced with geotextile filter fabric.
 - 1. Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. GSE Lining Technology, Inc.
 - b. JDR Enterprises, Inc.
 - c. Strata Systems, Inc.
 - d. Insert manufacturer's name.
 - 2. Drainage Core: Three-dimensional, PE nonwoven-strand geonet, approximately 0.25 inches thick.
 - a. Minimum In-Plane Flow Rate: 2.4 gpm/ft. 5 gpm/ft. of unit width at hydraulic gradient of 1.0 and normal pressure of 25 psig when tested according to ASTM D4716.
 - 3. Filter Fabric: Nonwoven geotextile of PP or polyester fibers or combination of both. Flow rates range from 120 to 200 gpm/sq. ft. when tested according to ASTM D4491.
- D. Ring Fabric Drainage Panels: Drainage-core panel for field application of geotextile filter fabric.
 - 1. Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. Invisible Structures, Inc.
 - b. Insert manufacturer's name.
 - 2. Drainage Core: Three-dimensional, HDPE rings-in-grid pattern, approximately 1 inch thick.
 - a. Minimum In-Plane Flow Rate: 40 gpm/ft. Insert value of unit width at hydraulic gradient of 1.0 Insert value and normal pressure of 25 psig when tested according to ASTM D4716.

2.4 SOIL MATERIALS

- A. Soil materials are specified in Section 312000 "Earth Moving."
- 2.5 WATERPROOFING FELTS
 - A. Material: Comply with ASTM D226, Type I, asphalt ASTM D227, coal-tar-saturated organic felt.

2.6 GEOTEXTILE FILTER FABRICS

- A. Description: Fabric of PP or polyester fibers or combination of both, with flow rate range from 110 to 330 gpm/sq. ft. when tested according to ASTM D4491.
- B. Structure Type: Nonwoven, needle-punched continuous filament.
 - 1. Survivability: AASHTO M 288 Class 2 Insert class.
 - 2. Styles: Flat and sock.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces and areas for suitable conditions where subdrainage systems are to be installed.
- B. If subdrainage is required for landscaping, locate and mark existing utilities, underground structures, and aboveground obstructions before beginning installation and avoid disruption and damage of services.
- C. Verify that drainage panels installed as part of foundation wall waterproofing is properly positioned to drain into subdrainage system.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Section 312000 "Earth Moving."

3.3 FOUNDATION DRAINAGE INSTALLATION

- A. Place impervious fill material on subgrade adjacent to bottom of footing after concrete footing forms have been removed. Place and compact impervious fill to dimensions indicated, but not less than 6 inches deep and 12 inches wide.
- B. Lay flat-style geotextile filter fabric in trench and overlap trench sides.
- C. Place supporting layer of drainage course over compacted subgrade and geotextile filter fabric, to compacted depth of not less than 4 inches.
- D. Encase pipe with sock-style geotextile filter fabric before installing pipe. Connect sock sections with [adhesive] [or] [tape].

- E. Install drainage piping as indicated in Part 3 "Piping Installation" Article for foundation subdrainage.
- F. Add drainage course to width of at least 6 inches on side away from wall and to top of pipe to perform tests.
- G. After satisfactory testing, cover drainage piping to width of at least 6 inches on side away from footing and above top of pipe to within 12 inches of finish grade.
- H. Install drainage course and wrap top of drainage course with flat-style geotextile filter fabric.
- I. Place layer of [flat-style geotextile filter fabric] [waterproofing felt] over top of drainage course, overlapping edges at least 4 inches.
- J. Install drainage panels on foundation walls as follows:
 - 1. Coordinate placement with other drainage materials.
 - 2. Lay perforated drainage pipe at base of footing. Install as indicated in Part 3 "Piping Installation" Article.
 - 3. Separate 4 inches of fabric at beginning of roll and cut away 4 inches of core. Wrap fabric around end of remaining core.
 - 4. Attach panels to wall beginning at subdrainage pipe. Place and secure molded-sheet drainage panels, with geotextile facing away from wall.
- K. Place backfill material over compacted drainage course. Place material in loose-depth layers not exceeding 6 inches. Thoroughly compact each layer. Final backfill to finish elevations and slope away from building.

3.4 UNDERSLAB DRAINAGE INSTALLATION

- A. Excavate for underslab drainage system after subgrade material has been compacted but before drainage course has been placed. Include horizontal distance of at least 6 inches between drainage pipe and trench walls. Grade bottom of trench excavations to required slope, and compact to firm, solid bed for drainage system.
- B. Lay flat-style geotextile filter fabric in trench and overlap trench sides.
- C. Place supporting layer of drainage course over compacted subgrade and geotextile filter fabric, to compacted depth of not less than 4 inches.
- D. Encase pipe with sock-style geotextile filter fabric before installing pipe. Connect sock sections with [adhesive] [or] [tape].
- E. Install drainage piping as indicated in Part 3 "Piping Installation" Article for underslab subdrainage.
- F. Add drainage course to width of at least 6 inches on side away from wall and to top of pipe to perform tests.

- G. After satisfactory testing, cover drainage piping with drainage course to elevation of bottom of slab, and compact and wrap top of drainage course with flat-style geotextile filter fabric.
- H. Install horizontal drainage panels as follows:
 - 1. Coordinate placement with other drainage materials.
 - 2. Lay perforated drainage pipe at inside edge of footing.
 - 3. Place drainage panel over drainage pipe with core side up. Peel back fabric and wrap fabric around pipe. Locate top of core at bottom elevation of floor slab.
 - 4. Butt additional panels against other installed panels. If panels have plastic flanges, overlap installed panel with flange.

3.5 RETAINING-WALL DRAINAGE INSTALLATION

- A. Lay flat-style geotextile filter fabric in trench and overlap trench sides.
- B. Place supporting layer of drainage course over compacted subgrade to compacted depth of not less than 4 inches.
- C. Encase pipe with sock-style geotextile filter fabric before installing pipe. Connect sock sections with [adhesive] [or] [tape].
- D. Install drainage piping as indicated in Part 3 "Piping Installation" Article for retaining-wall subdrainage.
- E. Add drainage course to width of at least 6 inches on side away from wall and to top of pipe to perform tests.
- F. After satisfactory testing, cover drainage piping to width of at least 6 inches on side away from footing and above top of pipe to within 12 inches of finish grade.
- G. Place drainage course in layers not exceeding 3 inches in loose depth; compact each layer placed and wrap top of drainage course with flat-style geotextile filter fabric.
- H. Place layer of [flat-style geotextile filter fabric] [waterproofing felt] over top of drainage course, overlapping edges at least 4 inches.
- I. Install drainage panels on wall as follows:
 - 1. Coordinate placement with other drainage materials.
 - 2. Lay perforated drainage pipe at base of footing as described elsewhere in this Specification. Do not install aggregate.
 - 3. If weep holes are used instead of drainage pipe, cut 1/2-inch- diameter holes on core side at weep-hole locations. Do not cut fabric.
 - 4. Mark horizontal calk line on wall at a point 6 inches less than panel width above footing bottom. Before marking wall, subtract footing width.
 - 5. Separate 4 inches of fabric at beginning of roll and cut away 4 inches of core. Wrap fabric around end of remaining core.

- 6. Attach panel to wall at horizontal mark and at beginning of wall corner. Place core side of panel against wall. Use concrete nails with washers through product. Place nails from 2 to 6 inches below top of panel, approximately 48 inches apart. [Construction adhesives, metal stick pins, or double-sided tape may be used instead of nails.] Do not penetrate waterproofing. Before using adhesives, discuss with waterproofing manufacturer.
- 7. If another panel is required on same row, cut away 4 inches of installed panel core and wrap fabric over new panel.
- 8. If additional rows of panel are required, overlap lower panel with 4 inches of fabric.
- 9. Cut panel as necessary to keep top 12 inches below finish grade.
- 10. For inside corners, bend panel. For outside corners, cut core to provide 3 inches for overlap.
- J. Fill to Grade: Place satisfactory soil fill material over compacted drainage course. Place material in loose-depth layers not exceeding 6 inches. Thoroughly compact each layer. Fill to finish grade.

3.6 LANDSCAPING DRAINAGE INSTALLATION

- A. Provide trench width to allow installation of drainage conduit. Grade bottom of trench excavations to required slope, and compact to firm, solid bed for drainage system.
- B. Lay flat-style geotextile filter fabric in trench and overlap trench sides.
- C. Place supporting layer of drainage course over compacted subgrade and geotextile filter fabric, to compacted depth of not less than 4 inches.
- D. Install drainage conduits as indicated in Part 3 "Piping Installation" Article for landscaping subdrainage with horizontal distance of at least 6 inches between conduit and trench walls. Wrap drainage conduits without integral geotextile filter fabric with flat-style geotextile filter fabric before installation. Connect fabric sections with [adhesive] [or] [tape].
- E. Add drainage course to top of drainage conduits.
- F. After satisfactory testing, cover drainage conduit to within 12 inches of finish grade.
- G. Install drainage course and wrap top of drainage course with flat-style geotextile filter fabric.
- H. Place layer of [flat-style geotextile filter fabric] [waterproofing felt] over top of drainage course, overlapping edges at least 4 inches.
- I. Fill to Grade: Place satisfactory soil fill material over drainage course. Place material in loose-depth layers not exceeding 6 inches. Thoroughly compact each layer. Fill to finish grade.

3.7 PIPING INSTALLATION

- A. Install piping beginning at low points of system, true to grades and alignment indicated, with unbroken continuity of invert. Bed piping with full bearing in filtering material. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions and other requirements indicated.
 - 1. Foundation Subdrainage: Install piping level and with a minimum cover of Insert dimension unless otherwise indicated.
 - 2. Underslab Subdrainage: Install piping level.
 - 3. Plaza Deck Subdrainage: Install piping level.
 - 4. Retaining-Wall Subdrainage: When water discharges at end of wall into stormwater piping system, install piping level and with a minimum cover of Insert dimension unless otherwise indicated.
 - 5. Landscaping Subdrainage: Install piping pitched down in direction of flow, at a minimum slope of 0.5 Insert value percent and with a minimum cover of Insert dimension unless otherwise indicated.
 - 6. Lay perforated pipe with perforations down.
 - 7. Excavate recesses in trench bottom for bell ends of pipe. Lay pipe with bells facing upslope and with spigot end entered fully into adjacent bell.
- B. Use increasers, reducers, and couplings made for different sizes or materials of pipes and fittings being connected. Reduction of pipe size in direction of flow is prohibited.
- C. Install thermoplastic piping according to ASTM D2321.

3.8 PIPE JOINT CONSTRUCTION

- A. Join perforated PE pipe and fittings with couplings according to ASTM D3212 with loose banded, coupled, or push-on joints.
- B. Join perforated PVC sewer pipe and fittings according to ASTM D3212 with loose bell-and-spigot, push-on joints.
- C. Special Pipe Couplings: Join piping made of different materials and dimensions with special couplings made for this application. Use couplings that are compatible with and fit materials and dimensions of both pipes.

3.9 BACKWATER VALVE INSTALLATION

- A. Comply with requirements for backwater valves specified in Section 334100 "Storm Utility Drainage Piping."
- B. Install horizontal backwater valves in header piping downstream from perforated subdrainage piping.
- C. Install horizontal backwater valves in piping[in manholes or pits] where indicated.

3.10 CLEANOUT INSTALLATION

- A. Comply with requirements for cleanouts specified in Section 334100 "Storm Utility Drainage Piping."
- B. Cleanouts for [Foundation] [Retaining-Wall] [and] [Landscaping] Subdrainage:
 - 1. Install cleanouts from piping to grade. Locate cleanouts at beginning of piping run and at changes in direction. Install fittings so cleanouts open in direction of flow in piping.
 - 2. In vehicular-traffic areas, use NPS 4 cast-iron soil pipe and fittings for piping branch fittings and riser extensions to cleanout. Set cleanout frames and covers in a cast-in-place concrete anchor, [18 by 18 by 12 inches] <Insert dimensions> deep. Set top of cleanout flush with grade.
 - 3. In nonvehicular-traffic areas, use NPS 4 [cast-iron] [PVC] pipe and fittings for piping branch fittings and riser extensions to cleanout. Set cleanout frames and covers in a cast-in-place concrete anchor, [12 by 12 by 4 inches] <Insert dimensions> deep. Set top of cleanout [1 inch] [2 inches] <Insert dimension> above grade.
 - 4. Comply with requirements for concrete specified in Section 033000 "Cast-in-Place Concrete."
- C. Cleanouts for Underslab Subdrainage:
 - 1. Install cleanouts and riser extensions from piping to top of slab. Locate cleanouts at beginning of piping run and at changes in direction. Install fittings so cleanouts open in direction of flow in piping.
 - 2. Use NPS 4 cast-iron soil pipe and fittings for piping branch fittings and riser extensions to cleanout flush with top of slab.

3.11 CONNECTIONS

- A. Comply with requirements for piping specified in Section 334100 "Storm Utility Drainage Piping." Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect low elevations of subdrainage system to [building's] solid-wall-piping storm drainage system.
- C. Where required, connect low elevations of [foundation] [underslab] subdrainage to stormwater sump pumps. Comply with requirements for sump pumps specified in Section 221429 "Sump Pumps."

3.12 IDENTIFICATION

- A. Arrange for installation of green warning tapes directly over piping. Comply with requirements for underground warning tapes specified in specified in Section 312000 "Earth Moving."
 - 1. Install PE warning tape or detectable warning tape over ferrous piping.
 - 2. Install detectable warning tape over nonferrous piping and over edges of underground structures.

3.13 FIELD QUALITY CONTROL

- A. Tests and Inspections:
 - 1. After installing drainage course to top of piping, test drain piping with water to ensure free flow before backfilling.
 - 2. Remove obstructions, replace damaged components, and repeat test until results are satisfactory.
- B. Drain piping will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

3.14 CLEANING

A. Clear interior of installed piping and structures of dirt and other superfluous material as work progresses. Maintain swab or drag in piping and pull past each joint as it is completed. Place plugs in ends of uncompleted pipe at end of each day or when work stops.

END OF SECTION 334600