

Project Manual

VOLUME 2 OF 3

***CSM CIP2 BUILDING 5N PROJECT
COLLEGE OF SAN MATEO***

San Mateo, CA

AS-BUILT SPECIFICATIONS

May 11, 2010

Developed for:
College of San Mateo
San Mateo, CA



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College of San Mateo
San Mateo, CA



- SECTION 00005 -

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SUBSURFACE INVESTIGATION

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 SECTION INCLUDED

- A. All labor, materials, tools, equipment, transportation, and temporary construction of any nature necessary for a complete operational installation of all work shown on the Plans and/or specified hereinafter.

1.3 RELATED SECTIONS

- A. Consult all other Specification sections, determine the extent and character of related work, and properly coordinate work specified herein with that specified elsewhere to produce a complete operational installation.

1.4 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - 1. D1556: Density of Soil in Place by Sand Cone Method.
 - 2. D1557: Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-lb (4.54-kg) Rammer and 18-in (457-mm) Drop.
 - 3. D2922: Density of Soil and Soil Aggregate in Place by Nuclear Methods (Shallow Depths).
- B. California Department of Transportation (CDT):
 - 1. Standard Test Methods: No. 216, 231 and 301.
- C. Geotechnical Report:
 - 1. A geotechnical report is available and is titled "Preliminary Geotechnical Investigation: Improvements at College of San Mateo, San Mateo, California" prepared by TRC, dated June 8, 2007.

1.5 SOILS INVESTIGATION INTERPRETATION

- A. Soils investigation data is provided by the Owner for information and the convenience of bidders. Bidders are urged to examine soils investigation data and to make their own investigation of the site before bidding. The Owner and Engineer disclaim any responsibility for the accuracy, true location and extent of the soils investigations that have been prepared by others. They further disclaim responsibility for interpretation of that data by bidders as in projecting soil-bearing values, rock or soil profiles, soil stability and the presence, level and extent of underground water. Soils investigation data is not part of the Contract Documents.

1.6 SOILS TESTING DURING CONSTRUCTION

- A. Usual Services by Soils Engineer Retained by the Owner:
1. Site Grading and Excavation: Selection of fill materials for reuse on Project shall be based on testing by the Soils Engineer. Bottoms of excavations shall be checked and tested for suitability.
 2. Footings, Piers and Caissons: Bottom of excavations shall be checked and tested for soil suitability. The Architect and Structural Engineer shall be advised on all revisions necessary to meet Specifications for foundation excavations.
 3. Backfill Operations: Soils Engineer shall test import and native materials for suitability and for compaction.
 4. Utility Trenching and Other Miscellaneous Operations: Soils Engineer shall test materials and compaction.
 5. Roads and Parking Areas: Soils Engineer shall test materials and compaction of sub-grade, sub-base, base and surface courses.
- B. Soils Testing Services for Which the Contractor Must Pay:
1. For retesting and inspection of rejected work, and in cases where the Contractor does not expedite the soils work in accordance with the Specifications, the Engineer shall prepare a credit change order to the Contract to reimburse the Owner for extra services rendered by the Soils Engineer. The Owner will require the Soils Engineer to invoice separately for the extra work, which will establish the amount of the change order. The Owner will, upon execution of the credit change order, pay the Soils Engineer directly for its extra work.

1.7 ARCHEOLOGICAL SITES

- A. General:
1. Any grading and/or excavation work shall be monitored by an archaeologist (or suitable representative) designated by the property owner to inspect for the presence of prehistoric cultural resources.
 2. Should evidence of prehistoric cultural resources be discovered during monitoring, work in the immediate area shall be stopped to allow adequate time for evaluation and mitigation; the material shall be evaluated; and if significant, a mitigation program including collection and analysis of the materials prior to resumption of grading, preparation of a report, and curation of the materials at a recognized storage facility shall be developed and implemented under the direction of the property owner and the Director of Community Development.
 3. Interruptions to Contractor's construction operations resulting in monetary loss will be handled by an appropriate change order.

SUBSURFACE INVESTIGATION

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 TEST METHODS

- A. Relative Compaction: In-place compaction testing shall be in accordance with one or more of the following methods (at the Soils Engineer's option): ASTM D1556, or ASTM D2922. Laboratory testing shall be in accordance with one or more of the following methods (at the Soils Engineer's option): California Test Method No. 216 or ASTM D1557.
- B. Resistance Value (R Value): The R Value of soil materials shall be as determined by California Test Method No. 301.

- END OF SECTION -

- SECTION 02 4113 -

SITE DEMOLITION

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. Removing above-grade site improvements within limits indicated.
- B. Disconnecting, capping or sealing, and abandoning site utilities in place.
- C. Disconnecting, capping or sealing, and removing site utilities.
- D. Disposing of objectionable material.

1.3 RELATED SECTIONS

- A. Section 01 74 19 "Materials Recycling & Waste Management".
- B. Section 01 81 13 "LEED Certification Requirements".
- C. Section 31 11 00 "Site Preparation".
- D. Section 31 23 33 "Trenching, Backfilling and Compacting".

1.4 DEFINITIONS

- A. ANSI: American National Standards Institute.
- B. CAL-OSHA: California Occupational Safety and Health Administration.

1.5 SUBMITTALS

- A. LEED Submittal: See Section 01 81 13 LEED Certification Requirements for the following:
 - 1. MRc2 Construction Waste Management: Construction waste management plan complying with Section 01 74 19 Materials Recycling & Waste Management.

2. MRc4 Recycled Content: Product data for products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content.
 - a. Include cost information for each product having recycled content.

1.6 PROJECT CONDITIONS

- A. District assumes no responsibility for actual condition of the site to be altered.
 1. Conditions existing at time of inspection for bidding purpose will be maintained by District as far as practical.
- B. Disposal of Existing Improvements:
 1. All materials removed shall become the property of the Contractor; dispose of these materials outside the project site.
 - a. Do not dispose of removed materials to the general public by sale, gift or in any other manner at the project site.
 - b. These provisions shall not be construed as limiting or prohibiting sale or disposal of such materials at the Site to duly licensed Contractors or material suppliers, provided materials are removed from construction site by the Contractor.
 2. All removal of debris from the site, including removal of inventory to site of storage, is part of this Contract and shall be done by Contractor's employees and no others.
- C. Salvage:
 1. Recycle AC pavement and Class II AB where practical.
 2. Recycle concrete where practical.
 3. Items indicated to be salvaged shall be removed carefully, cleaned, and returned to the District. Coordinate with the Project Manager.
- D. Protection:
 1. Erect and maintain temporary bracing, shoring, lights, barricades, except construction barricades for subsequent new construction, warning signs, and guards necessary to protect public, the District's employees, adjacent improvements to remain, and adjoining property from damage, all in accordance with applicable regulations.
 2. Wet down areas affected by this work as required to prevent dust and dirt from rising.
- E. Scheduling:
 1. Coordinate with the Project Manager in scheduling noisy or dirty work.
 2. The Project Manager will supply a schedule of days on which no construction will be allowed.
 3. Contractor shall take College schedule into consideration during construction.
 4. Coordinate and schedule temporary water shut-downs and temporary water service with the Project Manager, Facilities, and the Water Department, and the Fire Department.
- F. Traffic Circulations: Ensure minimum interference with roads, streets, driveways, sidewalks, and adjacent facilities.
 1. Minimize obstruction to thoroughfares by first obtaining the required approval or permission of the responsible jurisdiction.

2. Where closing of a vehicular traffic circulation route is necessary, provide adequate directional signs to minimize the potential for confusion. Provide access at all times for emergency vehicles.
- G. Safety:
1. The College of San Mateo campus has a history of serpentine rock. The Contractor shall take all necessary precautions to eliminate the exposure of workers, students, staff, and the public to asbestos fibers, including but not limited to: dust control measures and measures included in Sections 93106 and 93105 of California Code of Regulations, Title 17.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. Backfill excavations resulting from demolition operations with on-site or import materials conforming to structural backfill defined in Section 31 20 00 - Earth Moving (Earthwork).

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect and maintain benchmarks and survey control points during construction.
- B. Protect existing site improvements to remain during construction.

3.2 RESTORATION

- A. Restore damaged improvements to their original condition, as acceptable to the Owner.

3.3 UTILITIES

- A. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed or abandoned.
- B. Arrange to shut off indicated utilities with utility companies or verify that utilities have been shut off.
- C. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless authorized in writing by the Owner, and then only after arranging to provide temporary utility services according to requirements indicated.
- D. Coordinate utility interruptions with utility company affected.
- E. Do not proceed with utility interruptions without the permission of the Owner and utility company affected. Notify Owner and utility company affected two working days prior to utility interruptions.

- F. Excavate and remove underground utilities that are indicated to be removed.
- G. Securely close ends of abandoned piping with tight fitting plug or wall of concrete minimum 6-inches thick.

3.4 SITE IMPROVEMENTS

- A. Remove existing above- and below-grade improvements as indicated and as necessary to facilitate new construction.
- B. Remove slabs, paving, curbs, and gutters, as indicated. Where concrete slabs, curb, gutter and asphalt pavements are designated to be removed, remove bases and subbase to surface of underlying, undisturbed soil.
- C. Unless the existing full-depth joints coincide with line of pavement demolition, neatly saw-cut to full depth the length of existing pavement to remain before removing existing pavement. Saw-cut faces vertically.
- D. Remove driveways, curbs, gutters and sidewalks by saw cutting to full depth. If saw cut falls within 30-inches of a construction joint, expansions joint, score mark or edge, remove material to joint, mark or edge.

3.5 BACKFILL

- A. Place and compact material in excavations and depressions remaining after site clearing in conformance with Section 31 23 33 – Trenching, Backfilling and Compacting.

3.6 DISPOSAL

- A. Remove surplus obstructions, demolished materials, and waste materials, including trash and debris, and legally dispose of them off the Owner's property.
- B. Burning of demolished materials is prohibited.

3.7 FIELD QUALITY CONTROL

- A. The Project Manager will accompany the Contractor before and after performance of work to observe physical condition of existing structures or improvements involved.

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- SECTION 03 1000 -

CONCRETE FORMING

PART 1 - GENERAL

1.1 RELATED INFORMATION AND REQUIREMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary and Division 1 Specification Sections, specific Specification Sections listed below, and all other Specification Sections apply to this Section.
 - 1. Concrete Reinforcing
 - 2. Cast-In-Place Concrete
 - 3. Concrete Curing
 - 4. Concrete Finishing

1.2 SECTION INCLUDES

- A. Construction: Provide material, labor, equipment, mock-ups, services, tests and inspections, necessary for the installation, shoring, bracing, and removal of concrete formwork.
- B. Engineering: Provide engineering services for the design and implementation of concrete formwork, including required shoring and bracing.

1.3 RELATED SECTIONS

- A. Section 01 74 19 "Materials Recycling & Waste Management".
- B. Section 01 81 13 "LEED Certification Requirements".

1.4 REFERENCE DOCUMENTS

- A. Standards: Comply with the provisions of the documents listed below and with the requirements described in this Section. Use current editions of documents unless earlier editions are specifically referenced by the governing code or are otherwise indicated.
 - 1. CBC – 2007 California Building Code.
 - 2. AAMA - American Architectural Manufacturer's Association, product specifications referenced herein.
 - 3. ACI - American Concrete Institute,
 - a. ACI 117, "Standard Specifications for Tolerances for Concrete Construction and Materials".
 - b. ACI 301, "Specifications for Structural Concrete".

- c. ACI 347, "Guide to Formwork for Concrete".
- 4. ASTM - American Society for Testing and Materials, designations referenced herein.
- 5. State of California,
 - a. Construction Safety Orders (CAL/OSHA).
 - b. Code of Regulations (CCR).

1.5 SUBMITTALS

- A. General: Submittals shall be sent to the Architect, or District's Testing Agency, or both, as required herein for review prior to commencing the work. Review of submittals covers the general character of the details and to verify compliance with the performance requirements. Review does not cover checking of quantities, proportions or dimensions. Such review shall not relieve the Contractor from responsibility for executing the work in accordance with the Contract Documents.
- B. LEED Submittal: See Section 018113 LEED Certification Requirements for the following:
 - 1. MRc4 Recycled Content: Product data for products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content.
 - a. Include cost information for each product having recycled content.
 - 2. MRc5 Regional Materials:
 - a. Sourcing location(s): indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery from the project site.
 - b. Manufacturing location(s): indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
 - c. Product Value: indicate dollar value of product containing regional materials; include materials costs only.
 - d. Product Component(s) Value: Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.

1.6 CONTRACTOR'S ENGINEERING SERVICES

- A. General: Where engineering services are required herein, the Contractor shall retain either a Civil or Structural Engineer registered in the State of California, referred to herein as the Contractor's Engineer.
 - 1. Documents prepared by the Contractor's Engineer shall be stamped and signed.
- B. Formwork: The Contractor's Engineer shall perform or supervise the design, inspection, and creation of scheduled procedures for concrete formwork, including, but not limited to, shoring, bracing, re-shoring, and form removal in accordance with ACI 347.

PART 2 - PRODUCTS

2.1 CONCRETE FORM MATERIALS

- A. Rough Form Finish (Concealed Surfaces): Plywood, lumber, metal, or other material of sufficient strength and stiffness to properly hold concrete in place. Provide lumber dressed on at least two edges and one side for tight fit and to prevent leakage of concrete.
- B. Smooth Form Finish (Exposed Surfaces): Form-facing panels that will provide continuous, straight, uniform textured, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize the number of joints.
 - 1. Wood Forms: Unless otherwise specified, wood forms shall be Douglas fir plywood, 5 ply, 3/4 inch, B-B Plyform, Class I, exterior type, edges sealed. Mill-oiled plywood shall not be permitted. Plywood sheets shall bear APA trademark stamp indicating plywood grade and thickness.
 - 2. Steel and Fiberglass Forms: Suitable for concrete construction.
- C. Round Column Forms: Metal, fiberglass, or spiral wound fiber tubes suitable for concrete construction.
- D. Lost Forms:
 - 1. Expanded polystyrene manufactured in accordance with ASTM C 578.
 - 2. Metal or cardboard specifically designed for use as concrete formwork.
 - 3. Expanded metal forms: Amico's "Stay-form", or equal.
 - 4. Wood shall not be used as lost forms without written permission from the Architect.
- E. Chamfer, drip, groove, and reveal strips: FRP, PVC, or smooth milled wood, fully sealed on all sides with two coats of form sealer.
- F. Form Ties: Factory fabricated, adjustable length removable or snap-off metal ties with 1" maximum diameter plastic cones inserts designed to prevent form movement and prevent concrete spalling upon removal. No part of form ties left in concrete members shall be closer than 1½" to concrete surfaces. Form ties used for structural members located below grade shall not be hollow and shall provide a water-stop washer placed at the center of the tie.
- G. Form Spreaders: Metal with plastic-covered tips at each end.
- H. Form Joint Caulking: Closed-cell PVC foam tape with pressure-sensitive adhesive on one side.
- I. Form Joint Sealer: Silicone or urethane sealant.
- J. Form Release Agent: Colorless, non-staining, non-toxic agent intended for this use that shall not impair the bonding of paint or other coatings. Manufactured by Noxcrete or equal.
- K. Form Spreaders: Metal with plastic-covered tips at each end.
- L. Form Joint Caulking: Compressible Tape meeting AAMA 810.1-92, Type I requirements.
- M. Form Joint Sealer: Sealant for form joints shall conform to ASTM C 920, Type a, Grade NS, or ASTM C 834.

- N. Form Sealer: Chemstop Manufacturing Company's "Chemstop", Burke's "form Sealer" W.R. Grace Company's "Formfilm", or equal.
- O. Form Release Agent: Colorless, non-staining, non-toxic agent intended for this use that shall not impair the bonding of paint or other coatings. Manufactured by Noxcrete or equal.

PART 3 - EXECUTION

3.1 PROTECTION OF MATERIALS

- A. Protect materials from damage, weather, and contaminants such as grease, oil, and dirt.

3.2 TOLERANCES

- A. Formwork for standard and architectural concrete shall be constructed such that the shapes, sizes, lines, and dimensions of cast-in-place concrete shown on the Drawings conform to the tolerances listed in the Section entitled "Cast-In-Place Concrete".
- B. Offsets between adjacent formwork facing materials for rough finish, concealed surface concrete formwork shall conform to ACI 117 Class C requirements.
- C. Offsets between adjacent formwork facing materials for smooth finish, exposed surface concrete formwork shall conform to ACI 117 Class B requirements.

3.3 COORDINATION

- A. The Contractor shall coordinate, locate, and provide sleeves and penetrations in formwork for electrical, plumbing, heating, ventilating, and other work.
- B. The Contractor shall locate, coordinate, provide, and verify openings, offsets, reveals, recesses, nailing blocks, channel cases, anchors, ties, and inserts in the formwork before concrete is placed.

3.4 CONCRETE FORMWORK CONSTRUCTION

- A. The construction and maintenance of concrete formwork shall be as directed by the Contractor's Engineer and in accordance with ACI 347.
- B. Formwork shall be new at the start of the job. Forms may be reused, provided they are thoroughly cleaned of dirt, mortar, oil, rust, and foreign materials, and are undamaged at edges and contact faces. Reuse of forms shall be subject to approval by the Architect.
- C. Formwork shall not stain the concrete.
- D. Oiling of forms shall not be permitted.
- E. The arrangement of formwork shall be uniform and neat.

- F. Formwork shall be built to support the weight of concrete within deformation limits, formed to the shapes, sizes, lines, and dimensions shown on the Drawings. Footings and grade beams do not require formwork unless otherwise indicated.
- G. Form ties shall provide accurate spreading and positive tying. Layout of ties shall be uniform, aligned, and symmetrical. Wire ties shall not be used.
- H. Provide chamfer strips at all exposed, protruding concrete corners, unless otherwise noted on Drawings.
- I. Form horizontal joints shall be level and continuous. Formwork vertical joints shall be plumb.
- J. Seal form joints with foam tape or form joint sealer. Forms shall be sealed sufficiently tight to prevent leakage of mortar.
- K. Provisions shall be made for openings, offsets, inserts, embedments, blocking, and other features of the work as shown or indicated. Penetrations, notches, and blockouts in concrete elements not shown on the Drawings shall not be installed without written approval from the Architect.
- L. Attach chamfers, drip, groove, and reveal strips securely to prevent displacement and dislodgement during concrete placement and form removal.
- M. Provide temporary openings at the base of wall and column forms to facilitate inspection of concrete reinforcement and to allow cleaning of forms. Do not locate temporary openings at exposed concrete surfaces.
- N. Apply form release agent to form surfaces prior to placement of reinforcement.
- O. Immediately prior to concrete placement, clean forms, wet forms, remove freestanding water, and seal temporary openings.

3.5 FORMWORK REMOVAL

- A. Formwork shall be removed according to the schedule and sequence prepared by the Contractor's Engineer and in accordance with ACI 347.
 - 1. Formwork shall not be removed until the concrete has hardened sufficiently to permit formwork removal with safety, and until the concrete members have attained sufficient strength and stiffness to safely support the imposed loads. The minimum times for removal of formwork after concrete has been placed shall be as shown below.
 - a. Footings (where required): 2 days
 - b. Columns: 3 days
 - c. Walls and Pilasters: 3 days; 7 days for Architectural Concrete
 - d. Side Forms for Joists, Beams, and Girders: 3 days
 - e. Soffit Forms for Joists, Beams, Girders, and One-Way Slabs: 7 days for form facing material; shore until concrete achieves design compressive strength, 7 days minimum.
 - f. Soffit Forms for Two-Way Slabs: 7 days for form facing material; shore until concrete achieves design compressive strength, 21 days minimum.

- g. Soffit Forms for Post-Tensioned Beams, Girders, and Slabs: As soon as full post-tensioning force has been applied.
 - 2. Formwork removal shall be coordinated with the requirements in the section titled "Concrete Curing".
- B. Formwork shall be removed without damaging the concrete exposed surfaces, chamfers, and inserts.

3.6 RESHORING

- A. Reshoring shall be as directed by the Contractor's Engineer and in accordance with ACI 347.
- B. Reshoring shall be designed and implemented in a manner that does not subject the concrete to excessive loads. The minimum time to begin reshoring is 14 days after the concrete has been placed, and not until the full compressive design strength of the concrete has been achieved.
- 1. Reshore locations shall not alter design stress patterns. Reshoring shall equal at least 50 percent of in-place shores and shall be placed immediately after shore removal.
 - 2. Previously placed concrete elements shall not support reshoring until their full design compressive strength has been achieved and not until at least 14 days after casting.

3.7 CONSTRUCTION LOADS

- A. Construction loads on concrete elements supported by concrete formwork shall be as directed by the Contractor's Engineer. Construction loads shall not exceed design loads indicated on the Drawings.

3.8 CORRECTION OF DEFECTIVE WORK

- A. Correction of defective work shall be the responsibility of the Contractor.
- B. Work not in compliance with the requirements of the Contract Documents shall be considered defective, unless otherwise directed in writing by the Architect.
- C. Corrected work shall conform to the requirements of the Contract Documents.
- D. The Contractor shall prepare a submittal documenting the defective work and proposed corrections and submit to the Architect for review. The submittal shall include a description of the defective work, the location of defective work, and shall be accompanied by supporting sketches, photographs, or both. Additionally, the submittal shall include similar documentation of the Contractor's proposed corrections.
- E. Correction of defective work shall not commence until the Architect has reviewed and accepted the submittal.
- F. Correction of defective work shall be inspected by the District's Testing Agency.

3.9 CLEAN-UP

- A. Remove from the site all debris resulting from the work of this Section.

- END OF SECTION -

- SECTION 03 2000 -**CONCRETE REINFORCING**

PART 1 - GENERAL**1.1 RELATED INFORMATION AND REQUIREMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, specific Specification Sections listed below, and all other Specification Sections apply to this Section.
 - 1. Concrete Forming
 - 2. Cast-In-Place Concrete
 - 3. Concrete Curing
 - 4. Concrete Finishing

1.2 SECTION INCLUDES

- A. Construction: Provide material, labor, equipment, services, mock-ups, tests and inspections necessary for the installation of concrete reinforcement.

1.3 RELATED SECTIONS

- A. Section 01 74 19 "Materials Recycling & Waste Management".
- B. Section 01 81 13 "LEED Certification Requirements".

1.4 REFERENCE DOCUMENTS

- A. Standards: Comply with the provisions of the documents listed below and with the requirements described in this Section. Use current editions of documents unless earlier editions are specifically referenced by the governing code or are otherwise indicated.
 - 1. CBC – 2007 California Building Code.
 - 2. ACI - American Concrete Institute,
 - a. ACI 117, "Standard Specifications for Tolerances for Concrete Construction and Materials".
 - b. ACI 301, "Specification for Structural Concrete for Buildings".
 - c. ACI 315, "Details and Detailing of Concrete Reinforcement".
 - 3. ASTM - American Society for Testing and Materials, designations referenced herein.
 - 4. AWS - American Welding Society,
 - a. AWS D1.1, "Structural Welding Code - Steel".

- b. AWS D1.4, "Structural Welding Code - Reinforcing Steel".
5. CRSI - Concrete Reinforcing Steel Institute,
 - a. CRSI MSP-1, "Manual of Standard Practice".
 - b. CRSI, "Placing Reinforcing Bars".
6. ICC-ES - International Code Council Evaluation Services, Evaluation Reports referenced herein.

1.5 SUBMITTALS

- A. General: Submittals shall be sent to the Architect, or District's Testing Agency, or both, as required herein for review prior to commencing the work. Review of submittals covers the general character of the details and to verify compliance with the performance requirements. Review does not cover checking of quantities, proportions or dimensions. Such review shall not relieve the Contractor from responsibility for executing the work in accordance with the Contract Documents.
- B. Shop Drawings: The Contractor shall submit concrete reinforcement shop drawings prepared in accordance with ACI 315 to the Architect for review. Fabrication or delivery of material to the building site shall not begin until the Architect's review is complete.
 1. Shop drawings shall include plan, elevation, and detail views with project grids accurately indicating bar material type, size, lengths, locations, bends, lap splice lengths and locations, welded splice locations, mechanical coupler locations, and headed bar locations.
 2. Layering and sequencing information for intersections shall be identified.
 3. Shop drawings shall not include copies of Contract Document details. References to Contract Document details in lieu of details prepared as part of placing drawing submittals will not be accepted.
 4. Shop drawings shall list the structural materials included in the submittal. Reinforcement shown on placing drawings illustrating sequencing, layering, or intersections, but not included in the placing drawing bar lists, shall be identified as "previously submitted" or "to be submitted".
- C. LEED Submittal: See Section 018113 LEED Certification Requirements for the following:
 1. MRc4 Recycled Content: Product data for products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content.
 - a. Include cost information for each product having recycled content.
 2. MRc5 Regional Materials:
 - a. Sourcing location(s): indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery from the project site.
 - b. Manufacturing location(s): indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
 - c. Product Value: indicate dollar value of product containing regional materials; include materials costs only.
 - d. Product Component(s) Value: Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.

CONCRETE REINFORCING

- D. Mill Certificates: The Contractor shall submit mill certificates in accordance with ASTM designations referenced herein for each heat of reinforcement, mechanical couplers, and headed bars to the District's Testing Agency for review.
- E. Welding Documents: The Contractor shall submit Welding Procedure Specifications (WPSs), Procedure Qualification Records (PQRs), and Welder Qualification Test Records (WQTRs) prepared in accordance with AWS D1.4 for each type of weld and position to be performed to the District's Testing Agency for review.
- F. Manufacturer's Data: The Contractor shall submit manufacturer ICC-ES reports for mechanical couplers and headed bars to the Architect for review.
- G. Samples: The Contractor shall submit samples of mechanical couplers and headed bars to the District's Testing Agency for testing as required herein and on the Drawings.
- H. Contractor's quality control test reports: The Contractor shall submit quality control test reports to the Architect and District's Testing Agency for review.

1.6 TESTS AND INSPECTIONS

- A. Notification:
 - 1. The Contractor shall notify the District's Testing Agency of work to be tested and inspected. Notification shall be sufficiently in advance to allow scheduling of tests and inspections, but not less than 24 hours.
 - 2. The Contractor shall immediately notify the Architect if the District's Testing Agency indicates that quality assurance tests and inspection requirements have not been met.
- B. District's Quality Assurance Tests and Inspections:
 - 1. General: Quality assurance tests and inspections shall be the responsibility of the District. The District shall retain a testing agency, referred to herein as the District's Testing Agency, who shall perform the required tests and inspections, prepare written summary reports of tests and inspections, and review submittals.
 - 2. The District's Testing Agency shall inspect material, size, spacing, arrangement, placement, and cover of reinforcement.
 - 3. The District's Testing Agency shall verify heat number of bundles with mill analysis certificates and shall perform tension and bend tests on reinforcement bars in accordance with ASTM A 370, "Standard Test Methods and Definitions for Mechanical Testing of Steel Products" as indicated below. Test reports shall be reviewed before placement of reinforcement.
 - a. Where samples are taken from bundles as delivered from the mill, with the bundles identified as to heat number and provided the mill analyses accompany the material, one tensile and one bend test shall be conducted on the material for each 10 tons or fraction thereof of each size of reinforcement bar.
 - b. Where positive identification of heat numbers cannot be made or where random samples are taken, one tensile and one bend test shall be conducted on the material for each 2 ½ tons or fraction thereof of each size of reinforcement bar.

4. The District's Testing Agency shall conduct tension load tests on Type II and Type III mechanical couplers at the frequency indicated on the Drawings, but not less than 1 test for each 100 mechanical couplers or fraction thereof. Perform tests on no less than four couplers of each type. Test specimens shall be selected at random. Tension tests shall be conducted to failure of the coupler or rupture of the bar in accordance with ASTM A 370. Alternatively, where the supplier conducts tension load tests in conformance with ASTM A 370 at a frequency that meets or exceeds that stated above, the District's Testing Agency may observe tension load tests performed by the supplier in lieu of performing tension load tests.
 5. The District's Testing Agency shall verify compliance with the manufacturer's recommended installation procedures on in-place mechanical couplers, and headed bars that utilize threaded connections, at the frequency indicated on the Drawings, but not less than 10%.
 6. The District's Testing Agency shall observe tension tests performed on Type II and Type III headed reinforcement at the frequency indicated on the Drawings, but not less than 1 test for each 100 headed bars or fraction thereof. Perform tests on no less than four headed bars. Test specimens shall be selected at random. Tension tests shall be conducted to failure of the head or rupture of the bar in accordance with ASTM A 970.
 7. Welding of reinforcement shall be inspected by the District's Testing Agency in accordance with AWS D1.4, and, where indicated, AWS D1.1.
 - a. Review the WPSs, PQRs, WQTRs, and suitability of welding equipment.
 - b. Inspect welding work, including surface preparation, preheat, welder technique and performance, equipment, weld lengths, and weld sizes for conformance with the WPSs.
 - c. Perform visual inspection of fillet, flare-v-groove, and flare-bevel-groove welds of reinforcement bars to structural steel.
 - d. Perform visual inspection and nondestructive testing of complete joint penetration (CJP) groove welds. Nondestructive testing shall be magnetic particle testing performed in accordance with ASTM E 709.
 - e. For reinforcement bars welded to structural steel, verify surface preparation, required preheat, and filler metal type for the structural steel conforms to AWS D1.1 requirements.
- C. Contractor's Quality Control Tests and Inspections:
1. General:
 - a. Quality control tests and inspections shall be the responsibility of the Contractor.
 - b. Where required herein, the Contractor shall demonstrate that quality control conforms to the requirements of the Contract Documents.
 - c. Quality Control Test and Inspection Reports shall be prepared and submitted for review.
 2. Tension tests of reinforcement bar not accompanied by certified mill analysis reports: The Contractor shall conduct one tension test and one bend test in accordance with ASTM A 370 for each 2 ½ tons or fraction thereof of each material type and size of reinforcement bar not accompanied by certified mill analysis reports. Test reports shall be reviewed by the District's Testing Agency before placement of reinforcement.

PART 2 - PRODUCTS

2.1 REINFORCEMENT MATERIALS

- A. Reinforcement:
 - 1. Typical Bars: Deformed, material type as indicated on the Drawings.
 - a. ASTM A 706, Grade 60.
 - b. ASTM A 615, Grade 60.
 - 2. Special Bars: Bars end-fitted with friction-welded components shall be ASTM A 706, deformed.
 - 3. Bars Welded to Structural Steel: ASTM A 706, deformed.
- B. Deformed Bar Anchors (DBA): See Section titled "Structural Steel".
- C. Spiral Wire Reinforcement: ASTM A 82.
- D. Welded Wire Fabric: Sheets conforming to ASTM A 185.

2.2 TIE WIRE AND BAR SUPPORTS

- A. Tie Wire: #16 gauge (AWG) or heavier, black annealed wire.
- B. Tie Wire for Architectural Concrete: #16 gauge (AWG) or heavier, ASTM A 492 stainless steel.
- C. Bar supports in shall be provided as follows.
 - 1. Typical Supports in Contact with Formwork, Unless Otherwise Noted: CRSI Class 2 - Type A, or all-plastic supports.
 - 2. Supports in Contact with Ground: Precast concrete blocks ("dobies") with embedded wires.
 - 3. Supports Not in Contact with Formwork or Ground: Lengths of reinforcement bar, or metal or plastic spreaders and separator specifically intended for support of concrete reinforcement.
 - 4. Supports for Architectural Concrete: CRSI Class I plastic-protected stainless steel.

2.3 MECHANICAL COUPLERS AND HEADED BARS

- A. Mechanical Couplers: Standard, transition, position, and half-couplers (form savers) for reinforcement bars shall be as follows. Swaged and wedged couplers shall not be used. Type II or Type III couplers may be used in lieu of Type I at the Contractor's option, provided that these couplers can be dimensionally accommodated in the reinforcing cage.
 - 1. Type I couplers shall meet the requirements of the CBC.
 - a. BarSplice Products' "ZAP Screwlok 'SL' series".
 - b. Dayton/Richmond's "DB-SAE series coupler".
 - c. Erico Lenton's "A2 series coupler".
 - d. BarSplice Products' "Standard Barsplicer System" (A 615 reinforcement only)
 - e. Dayton/Richmond's "Barlock S/CA-series coupler" (A 615 reinforcement only).

2. Type II couplers shall meet the requirements of the CBC. Couplers shown on the drawings shall be Type II, unless otherwise shown or indicated.
 - a. BarSplice Products' "ZAP Screwlok" series.
 - b. Erico Lenton's "A12 & P14L" series.
 - c. Dayton/Richmond's "Barlock L-series" (A 615 reinforcement only).
 - d. Dayton/Richmond's "US/MC-SAE" series (A 615 reinforcement only).
 3. Type III couplers shall meet the requirements of the CBC for Type II couplers. In addition, Type III couplers shall be capable of developing the full rupture strength of the reinforcement bar without failure of the coupler following a minimum ductile elongation of 10% of the sample length, or 175% of the specified reinforcement yield strength, whichever is greater. Type III couplers shall conform to the dimensional tolerances shown on the Drawings such that special ties or hoops are not required at the coupler, required concrete cover requirements are not violated, and location of longitudinal bars is not altered.
 - a. Headed Reinforcement Corporation's "HRC 400" (A 706 reinforcement only) or "HRC 500" series.
 - b. Erico Lenton's "A12 Plus & P14 Plus" series, or approved equal.
- B. Headed Bars:
1. Type I headed bars shall be used where indicated on the drawings and in lieu of hooked bar ends at the Contractor's option except where Type II or Type III headed bars are indicated. Terminations shall be capable of developing the specified yield strength of the reinforcing bar.
 - a. Erico Lenton's "Terminator D6" series headed bars.
 - b. BarSplice Products' "DoughNUT" series headed bars (A 615 reinforcement only).
 2. Type II headed bars shall be used where indicated on the drawings. Terminations shall be capable of developing 160% of the specified yield strength of the reinforcing bar. Headed bars shown on the drawings shall be Type II, unless otherwise shown or indicated.
 - a. Dayton/Richmond's "D-158" series headed bars.
 - b. Erico Lenton's "Terminator D16" series headed bars.
 3. Type III headed bars shall be used where indicated on the drawings. Terminations shall be capable of developing the full rupture strength of the reinforcement outside the termination following a minimum ductile elongation of 10% of the sample length, or 175% of the specified reinforcement yield strength, whichever is greater. Type III headed bars shall conform to the dimensional tolerances shown on the Drawings such that the required concrete cover requirements are not violated.
 - a. Headed Reinforcement Corporation's "HRC 100" and "HRC 200" series T-Headed Bars (A 706 reinforcement only).
 - b. Erico Lenton's "Terminator D16 Plus" series headed bars.

2.4 WELDING ACCESSORIES

- A. Welding Filler Metals: Use AWS D1.4 matching type filler metals.

PART 3 - EXECUTION

3.1 PROTECTION OF MATERIALS

- A. Protect materials from damage, weather, and contaminants such as grease, oil, and dirt.

3.2 COORDINATION

- A. Coordinate locations and sizes of penetrations and openings in concrete members and verify conformance to structural requirement shown on the Drawings. Additional reinforcement at penetration and opening locations shall be as indicated on the Drawings.

3.3 FABRICATION

- A. Tolerances for reinforcement fabrication shall conform to the requirements of ACI 315.
- B. Reinforcement shall be shop fabricated to the lengths and bends shown on the Drawings, by experienced shops using methods that do not damage the reinforcement.
- C. Bars shall be cold bent.
- D. Concrete cover, measured to edge of reinforcement, mechanical couplers, and headed bars, shall be as shown and scheduled on the Drawings.
- E. Bars shall be placed, spaced, and aligned as indicated on the Drawings.
- F. Stagger splices of adjacent bars, unless otherwise shown on the Drawings.
- G. Where the Contractor utilizes reinforcement splices not shown on the Drawings, the splice locations shall be included in the reinforcement placing drawing submittals for review by the Architect. Splices of reinforcement shall not be made at points of maximum stress.
- H. Lap splices and dowel lengths shall be as indicated on the Drawings, but not less than 40 bar diameters, or 24 inches, whichever is more.
- I. Locate mechanical couplers and headed bars as shown on the Drawings. Where the Contractor utilizes mechanical couplers not shown on the Drawings, the coupler types and locations shall be included in the reinforcement placing drawing submittals for review by the Architect.
- J. Stagger mechanical coupler locations at adjacent reinforcement bars as indicated on the Drawings, but not less than 24 inches.
- K. Reinforcement bundles shall be tagged with suitable identification to facilitate sorting and placing.

3.4 PLACING

- A. Tolerances for placement of reinforcement shall conform to ACI 117.

- B. Prior to placing reinforcement, the contractor shall clean reinforcement free of scale, dirt, grease, or other foreign substances detrimental to bonding. Maintain cleanliness of reinforcement until it has been completely encased in concrete.
- C. Placement of reinforcement shall be in accordance with CRSI - Placing Reinforcing Bars.
- D. Concrete reinforcement shall be supported in conformance with the CRSI Manual of Standard Practice, and shall not be unsupported for lengths exceeding 4'-0". Use spreaders between curtains of vertical reinforcement to maintain bar alignment in the forms.
- E. Reinforcement shall be placed to meet the concrete cover, bar spacing, and bar alignment requirements indicated on the Drawings.
- F. Tie intersecting reinforcement bars with tie wire in accordance with the CRSI - Placing Reinforcing Bars to prevent displacement during casting of concrete. Tack welding of intersecting bars shall not be allowed.

3.5 MECHANICAL COUPLERS AND HEADED BARS

- A. Threaded mechanical couplers and headed bars shall be tightened with a torque wrench according to the manufacturer's recommendations.

3.6 WELDING

- A. Welding of reinforcement bars to structural steel shall be in accordance the requirements of AWS D1.4 for the reinforcement bar and AWS D1.1 for the structural steel surface preparation, filler metal type, and preheat.
- B. Welders shall be qualified for processes, positions, and weld thicknesses to be used by that welder.
- C. Shop welders, field welders, and welding foremen shall possess a copy of the approved WPSs.

3.7 REQUIREMENTS FOR ARCHITECTURAL CONCRETE

- A. At exposed faces of architectural concrete, bar chairs, supports, bolsters, and other devices shall not be attached to the form face material.
- B. Turn tie wires after cutting toward the inside of concrete members and bend in such a manner that concrete placement will not displace the wires toward exposed concrete surfaces.
- C. Welding of reinforcement shall be performed prior to placing reinforcement in formwork.

3.8 FIELD MODIFICATIONS

- A. Reinforcement shall not be field bent except where specifically indicated as such on the Drawings, or with written permission from the Architect. Bars kinked or bent during construction shall be considered defective work.

CONCRETE REINFORCING

3.9 CORRECTION OF DEFECTIVE WORK

- A. Correction of defective work shall be the responsibility of the Contractor.
- B. Work not in compliance with the requirements of the Contract Documents shall be considered defective, unless otherwise directed in writing by the Architect.
- C. Corrected work shall conform to the requirements of the Contract Documents.
- D. The Contractor shall prepare a submittal documenting the defective work and proposed corrections and submit to the Architect for review. The submittal shall include a description of the defective work, the location of defective work, and shall be accompanied by supporting sketches, photographs, or both. Additionally, the submittal shall include similar documentation of the Contractor's proposed corrections.
- E. Correction of defective work shall not commence until the Architect has reviewed and accepted the submittal.
- F. Correction of defective work shall be inspected by the District's Testing Agency.

3.10 CLEAN-UP

- A. Remove from the site all debris resulting from the work of this Section.

- END OF SECTION -

- SECTION 03 2530 -

EXPANSION ANCHORS

PART 1 - GENERAL

1.1 RELATED INFORMATION AND REQUIREMENTS

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

1.2 SECTION INCLUDES

- A. Construction: Provide material, labor, equipment, services, tests and inspections necessary for the installation of post-installed expansion anchors.

1.3 RELATED SECTIONS

- A. Section 01 74 19 "Materials Recycling & Waste Management".
- B. Section 01 81 13 "LEED Certification Requirements".

1.4 REFERENCE DOCUMENTS

- A. Standards: Comply with the provisions of the documents listed below and with the requirements described in this Section. Use current editions of documents unless earlier editions are specifically referenced by the governing code or are otherwise indicated.
 1. CBC – 2007 California Building Code.
 2. ACI 355.1, American Concrete Institute, "State-of-the-Art Report on Anchorage to Concrete".
 3. ASTM - American Society for Testing and Materials, designations referenced herein.
 4. Federal Specifications - United States General Services Agency Federal Specifications and Commercial Item Description reports as referenced herein.
 5. ICC-ES, International Code Council Evaluation Services, Evaluation Service Reports referenced herein.

1.5 SUBMITTALS

- A. General: Submittals shall be sent to the Architect, or District's Testing Agency, or both, as required herein for review prior to commencing the work. Review of submittals covers the general character of the details and to verify compliance with the performance requirements. Review does not cover checking of quantities, proportions or dimensions. Such review shall not relieve the Contractor from responsibility for executing the work in accordance with the Contract Documents.
- B. Manufacturer's Data: The Contractor shall submit the manufacturer's ICC-ES report to the Architect for review.
- C. LEED Submittal: See Section 018113 LEED Certification Requirements for the following:
 - 1. MRc4 Recycled Content: Product data for products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content.
 - a. Include cost information for each product having recycled content.
 - 2. MRc5 Regional Materials:
 - a. Sourcing location(s): indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery from the project site.
 - b. Manufacturing location(s): indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
 - c. Product Value: indicate dollar value of product containing regional materials; include materials costs only.
 - d. Product Component(s) Value: Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.

1.6 TESTS AND INSPECTIONS

- A. Notification:
 - 1. The Contractor shall notify the District's Testing Agency of work to be tested and inspected. Notification shall be sufficiently in advance to allow scheduling of tests and inspections, but not less than 24 hours.
 - 2. The Contractor shall immediately notify the Architect if the District's Testing Agency indicates that quality assurance tests and inspection requirements have not been met.
- B. District's Quality Assurance Tests and Inspections:
 - 1. General: Quality assurance tests and inspections shall be the responsibility of the District. The District shall retain a testing agency, referred to herein as the District's Testing Agency, who shall perform the required tests and inspections, prepare written summary reports of tests and inspections, and review submittals.
 - 2. The District's Testing Agency shall provide special inspection to verify compliance with the specifications and the product's ICC-ES report for the following items:
 - a. Drill type, bit, and setting.
 - b. Hole diameter, depth, and accuracy of location.
 - c. Cleanliness and surface preparation of holes.

EXPANSION ANCHORS

- d. Expansion anchor type and size.
 - e. Installation of expansion anchors.
 - f. Torque tightening.
3. The District's Testing Agency shall conduct static tension load tests on installed anchors. Test 10% of each diameter of anchor, or test as scheduled on the Drawings. Tests shall be in accordance with ASTM E 488, "Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements".
- a. Tests shall not begin until one full day after anchor installation.
 - b. Scheduled test load shall be applied for two minutes during which the maximum allowable slip shall be 1/8 inch.
 - c. If an anchor fails the tension load test, additional expansion anchors shall be tension load tested until 20 consecutively successful tests have been performed.
 - d. Provide tension load tests for replacement expansion anchors.
 - e. The District's Testing Agency shall develop and utilize an effective method of field marking locations and results of expansion anchor tests.
 - 1) Field marking for test locations shall not affect exposed concrete appearance.
 - 2) A detailed drawing record of test locations and results shall be acceptable.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Expansion Anchors:
 - 1. Anchors shall conform to Commercial Item Description A-A-1923A Type 4, carbon steel or stainless steel as indicated on the Drawings.
 - 2. Expansion anchors for use in normal weight concrete:
 - a. Hilti Corporation's "Kwik Bolt TZ" (ICC-ES Report ESR-1917).
 - b. Simpson Strong-Tie's "Strong-Bolt" (ICC-ES Report No. ESR-1771).
 - 3. Expansion anchors for use in lightweight concrete (installed directly to concrete or through bottom of light gage metal deck):
 - a. Hilti Corporation's "Kwik Bolt TZ" (ICC-ES Report ESR-1917).
 - b. Simpson Strong-Tie's "Strong-Bolt" (ICC-ES Report No. ESR-1771).
- B. Patching Mortar: BASF's "EMACO S66 CI", Sika Corporation's "SikaRepair 223", or equal.

PART 3 - EXECUTION

3.1 PROTECTION OF MATERIALS

- A. Protect materials from damage, weather, and contaminants such as grease, oil, and dirt.

3.2 LAYOUT

- A. Inspect areas to be drilled to verify conditions of access, interferences, and existing materials.
 - 1. Verify location of reinforcement in areas to be drilled using non-destructive methods. Contractor shall use care and caution to avoid cutting or damaging reinforcement. Maintain a minimum clearance of one inch between reinforcement and anchors or dowels, unless otherwise shown on the Drawings.

3.3 TOLERANCES

- A. Anchor hole locations shall conform to tolerances for the material being attached.

3.4 DRILLING AND PREPARATION OF HOLES

- A. Holes shall not be drilled in concrete that has not achieved its specified compressive strength and not until a minimum of seven days after concrete has been cast.
- B. Holes shall be drilled using the manufacturer's recommended drill type, bit, and setting, unless otherwise noted on the drawings.
- C. Hole diameter shall be as indicated by the manufacturer. Depth of hole shall be as indicated on the Drawings; however, in no case shall the embedment of expansion anchors be less than that required by the manufacturer.
- D. Where drilling causes the concrete to spall or crack, the holes shall be considered defective work.
- E. Dust and other contaminants shall be completely removed from holes by blowing with compressed air or other effective means.

3.5 ANCHOR INSTALLATION

- A. Installation of anchors in the holes shall be in accordance with manufacturer's recommendations.
- B. Anchors shall be tightened as recommended by the manufacturer to the installation torque values.

3.6 REPLACEMENT ANCHORS AT FAILED TEST LOCATIONS

- A. At failed tension load test locations:
 - 1. Remove anchor.
 - 2. Install replacement anchors in existing holes approved by the District's Testing Agency.
 - 3. Existing holes not approved by the District's Testing Agency shall be considered defective work.

EXPANSION ANCHORS

3.7 DAMAGED REINFORCEMENT

- A. Damage to existing reinforcement shall be considered defective work.

3.8 SURFACE REPAIRS AND FILLING OF ABANDONED HOLES

- A. Clean and repair surfaces damaged by drilling or installation. Cleaning and repairing requirements shall be as directed by the Architect.
- B. Abandoned holes shall be filled with patching mortar in accordance with the manufacturer's recommendations.

3.9 CORRECTION OF DEFECTIVE WORK

- A. Correction of defective work shall be the responsibility of the Contractor.
- B. Work not in compliance with the requirements of the Contract Documents shall be considered defective, unless otherwise directed in writing by the Architect.
- C. Corrected work shall conform to the requirements of the Contract Documents.
- D. The Contractor shall prepare a submittal documenting the defective work and proposed corrections and submit to the Architect for review. The submittal shall include a description of the defective work, the location of defective work, and shall be accompanied by supporting sketches, photographs, or both. Additionally, the submittal shall include similar documentation of the Contractor's proposed corrections.
- E. Correction of defective work shall not commence until the Architect has reviewed and accepted the submittal.
- F. Correction of defective work shall be inspected by the District's Testing Agency.

3.10 CLEAN-UP

- A. Remove from the site all debris resulting from the work of this Section.

- END OF SECTION -

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

PART 1 - GENERAL**1.1 RELATED INFORMATION AND REQUIREMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, specific Specification Sections listed below, and all other Specification Sections apply to this Section.
 - 1. Concrete Forming
 - 2. Concrete Reinforcing
 - 3. Concrete Curing
 - 4. Concrete Finishing

1.2 SECTION INCLUDES

- A. Construction: Provide material, labor, equipment, services, sample panels, mock-ups, trial batches, tests and inspections necessary for the installation of cast-in-place concrete. The work also includes the following:
 - 1. Furnishing and installation of rock base, vapor barrier and sand cover where shown under slabs-on-grade.
 - 2. Installation of inserts, sleeves, dowels, anchor bolts and other items embedded in concrete, but furnished under other sections.
- B. Engineering: Provide engineering services for the design and implementation of cast-in-place concrete mix designs.

1.3 RELATED SECTIONS

- A. Section 01 74 19 "Materials Recycling & Waste Management".
- B. Section 01 81 13 "LEED Certification Requirements".

1.4 REFERENCE DOCUMENTS

- A. Standards: Comply with the provisions of the documents listed below and with the requirements described in this Section. Use current editions of documents unless earlier editions are specifically referenced by the governing code or are otherwise indicated.
 - 1. CBC – 2007 California Building Code.

2. ACI - American Concrete Institute, Manual of Concrete Practice, including, but not limited to, the following sections:
 - a. ACI 117 "Standard Specifications for Tolerances for Concrete Construction and Materials".
 - b. ACI 211.1 "Recommended Practice for Selecting Proportions for Normal and Heavy Weight Concrete".
 - c. ACI 211.2 "Standard Practice for Selecting Proportions for Structural Lightweight Concrete".
 - d. ACI 301 "Specification for Structural Concrete for Buildings".
 - e. ACI 302.1R "Guide for Concrete Floor and Slab Construction".
 - f. ACI 304R "Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete".
 - g. ACI 304.2R "Placing Concrete by Pumping Methods".
 - h. ACI 305R "Hot Weather Concreting".
 - i. ACI 306R "Cold Weather Concreting".
 - j. ACI 308R "Guide to Curing Concrete".
 - k. ACI 309R "Guide for Consolidation of Concrete".
 - l. ACI 318 "Building Code Requirements for Structural Concrete".
3. ASTM, American Society for Testing and Materials, designations referenced herein.
4. Caltrans - California Department of Transportation, "Standard Specifications".
5. NRMCA - National Ready-Mix Concrete Association, Quality Control Manual – Section 3: Certification of Ready Mixed Concrete Production Facilities
6. TransLab - Caltrans Transportation Laboratory, "California Test Methods" as listed herein. Note: documentation of these test methods is available on the Internet.
7. State of California, Construction Safety Orders (CAL/OSHA).

1.5 SUBMITTALS

- A. General: Submittals shall be sent to the Architect, or District's Testing Agency, or both, as required herein for review prior to producing project concrete. Review of submittals covers the general character of the details, material properties of the concrete ingredients, and to verify compliance with the performance requirements. Review does not cover checking of quantities, proportions or dimensions. Such review shall not relieve the Contractor from responsibility for executing the work in accordance with the Contract Documents.
- B. Shop Drawings: The Contractor shall prepare and submit shop drawings to the Architect showing:
 1. Joints: Indicate details and locations of construction, control, and expansion joints.
 2. Penetrations and Openings: Indicate locations and sizes of penetrations in concrete members.
 3. Casting Sequence: The Contractor shall submit a proposed casting sequence for placing concrete to the Architect for review before commencing with the work. The sequence shall include the locations, extents, and structural members included in each pour.

- C. LEED Submittal: See Section 018113 LEED Certification Requirements for the following:
1. MRc4 Recycled Content: Product data for products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content.
 - a. Include cost information for each product having recycled content.
 2. MRc5 Regional Materials:
 - a. Sourcing location(s): indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery from the project site.
 - b. Manufacturing location(s): indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
 - c. Product Value: indicate dollar value of product containing regional materials; include materials costs only.
 - d. Product Component(s) Value: Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.
- D. NRMCA Certificate of Conformance: Submit a copy of the NRMCA Certificate of Conformance to the District's Testing Agency for the ready-mix plant, equipment, and mix trucks that will supply the concrete for the project.
- E. Product Data for Concrete Accessories: The Contractor shall submit manufacturer's data for each product to the Architect for review.
- F. Samples: When specifically requested by the Architect, provide samples of cementitious materials, aggregates, or both to the District's Testing Agency in adequate quantity to facilitate testing of these materials for conformance with the Specifications. Aggregate samples shall be taken in conformance with the requirements listed in ASTM C 33.
- G. Mix Design: The Contractor shall submit concrete mix designs for review by the Architect and District's Testing Agency at least seven days before placing concrete. Review of mix designs covers general conformance with the specifications, but does not constitute an approval of the mix proportions. Submit one mix design for each class of concrete. Each mix design shall include the following information:
1. Concrete class,
 2. Member types and specific placement locations,
 3. Material quantities per cubic yard,
 4. Material ingredient certificates of compliance,
 5. Coarse and fine aggregate sources, types, sizes, and gradation,
 6. Admixture product data and dosage,
 7. Design compressive strength, age (in days) required to reach design compressive strength, and compressive strength historic data,
 8. Maximum water to cementitious materials ratio,
 9. Design slump (or target slump range for self-consolidating mixes) at point of discharge from transit mix truck,
 10. Unit weight of freshly mixed and oven-dry concrete,

11. Calculated percent water-soluble chloride ions (Cl) by weight of cement, considering the chloride ion content of all concrete ingredients,
 12. Water-soluble chloride ion content historic data or trial batch test data, when required herein,
 13. Contractor's Engineer's stamp and signature certifying that the concrete mix has been designed under the supervision of the Contractor's Engineer.
- H. Historic data: When concrete mix design historic data is required herein to demonstrate conformance with the specification, the collected data shall satisfy the requirements stipulated for concrete mix trial batching requirements found under the "Contractor's Quality Control Tests and Inspections" section of this specification.
- I. Batch Ticket Information: The Contractor shall submit a copy of each delivery ticket to the District's Testing Agency for their record.
- J. Contractor's quality control test and inspection reports: The Contractor shall submit quality control test and inspection reports to the Architect and District's Testing Agency for review.

1.6 TESTS AND INSPECTIONS

- A. Notification:
1. The Contractor shall notify the District's Testing Agency of work to be tested and inspected. Notification shall be sufficiently in advance to allow scheduling of tests and inspections, but not less than 24 hours.
 2. The Contractor shall immediately notify the Architect if the District's Testing Agency indicates that quality assurance tests and inspection requirements have not been met.
 3. The Contractor shall notify the Architect 48 hours prior to placing concrete to facilitate structural observation.
- B. District's Quality Assurance Tests and Inspections:
1. General: Quality assurance tests and inspections shall be the responsibility of the District. The District shall retain a testing agency, referred to herein as the District's Testing Agency, who shall perform the required tests and inspections, prepare written summary reports of tests and inspections, and review submittals.
 2. Sample tests: When the Architect requires the Contractor to submit samples for cementitious materials, aggregates, or both, the District's Testing Agency shall test the samples for conformance with the specifications.
 3. Mix design and materials review: The District's Testing Agency shall review the Contractor's proposed mix designs and material certificates of compliance.
 4. Batch Plant Inspections: The District's Testing Agency shall provide inspections at the Contractor's concrete batch plant as detailed in CBC 1704A.4.3 or 1704A4.4.
 5. Job Site Special Inspections: The District's Testing Agency shall provide the following special inspections during the project construction:
 - a. Special inspection of location of embedded items and anchor bolts and anchor rods.
 - b. Special inspection of concrete placement.

6. Job-site monitoring: Where a Thermal Control Plan has been established, the District's Testing Agency shall monitor and record temperature measurements of the Contractor's thermal monitoring devices.
7. Job site samples: The District's Testing Agency shall take job site samples of fresh concrete in accordance with ASTM C 172. The volume of each sample shall be adequate to facilitate the required on-site and laboratory tests. Samples for each class of concrete shall be taken not less than once a day, or not less than once for every 150 cubic yards of concrete, or not less than once for every 5,000 square feet of surface area for slabs and walls.
 - a. If the total volume of concrete for the project is such that less than five samples would be collected for a given class of concrete, samples shall be made from at least 5 randomly selected batches, or from each batch if fewer than 5 batches are used.
 - b. Record the air temperature at the time of taking concrete samples.
8. Job site tests: From each sample taken, the following job-site tests shall be performed:
 - a. Slump: ASTM C 143,
 - b. Density and Air Content: ASTM C 138,
 - c. Temperature: ASTM C 1064.
9. Collection and curing of test specimens: From each concrete sample taken, collect and cure sets of test specimens as follows:
 - a. Compression cylinder test specimens: ASTM C 31. Collect a set of standard 6 by 12-inch cylinder test specimens. A set shall consist of four cylinder test specimens for concrete with compressive strength specified at 28 days or five cylinder test specimens for concrete with compressive strength specified at greater than 28 days. Test specimens shall be standard cured.
 - b. Shrinkage test specimens: ASTM C 157. When concrete classes require shrinkage tests, collect a set of shrinkage test specimens. A set shall consist of three test specimens. Specimens shall be standard cured and air stored.
10. Laboratory tests: Test specimens shall be laboratory tested after collection and curing as follows:
 - a. Perform compressive strength tests on compression cylinder test specimen sets in accordance with ASTM C 39.
 - 1) For concrete with compressive strength specified at 28 days, one specimen from each set shall be tested at 7 days after casting, two specimens from each set shall be tested at 28 days after casting, and the remaining cylinder in each set shall be kept for further testing, if required.
 - 2) For concrete with compressive strength specified at greater than 28 days, one specimen from each set shall be tested at 7 days after casting, one specimen from each set shall be tested at 28 days after casting, and two specimens from each set shall be tested at the age designated for determination of specified compressive strength, as indicated on the concrete mix design. The remaining cylinder in each set shall be kept for further testing, if required.
 - b. Perform shrinkage tests on shrinkage test specimen sets in accordance with ASTM C 157. Length measurements for each specimen shall be recorded at 14, 28, and 35 days after casting. Specimens shall be kept for further testing, if required.

- C. Contractor's Quality Control Tests and Inspections:
 - 1. General:
 - a. Quality control tests and inspections shall be the responsibility of the Contractor.
 - b. Where required herein, the Contractor shall demonstrate that quality control conforms to the requirements of the Contract Documents.
 - c. Quality Control Test and Inspection Reports shall be prepared and submitted for review.
 - 2. Concrete Mix Trial Batching: Where required herein, the Contractor's Testing Agency shall prepare concrete trial batches in accordance with ASTM C 192 as needed for preparation of test specimens. The number of batches and quantity of each batch shall be at least adequate to prepare the required number of test specimens for each of the required tests as follows. Test specimens for different tests may be taken from a single batch.
 - a. Compressive test specimens: Trial batch and test specimen quantity shall be in conformance with the requirements for the governing building code.
 - b. Water-soluble chloride ion test specimens: Prepare one trial batch. Prepare one test specimen from the trial batch and test after a minimum of 28-days after casting in conformance with ASTM C 1218.

1.7 CONTRACTOR'S ENGINEERING SERVICES

- A. General: Where engineering services are required herein, the Contractor shall retain either a Civil or Structural Engineer registered in the State of California, referred to herein as the Contractor's Engineer.
 - 1. Documents prepared by the Contractor's Engineer shall be stamped and signed.
- B. Concrete mix designs shall be prepared, signed, and stamped by the Contractor's Engineer certifying that the mix design has been prepared under supervision and that the mix designs meet the requirements of the Contract Documents.
- C. Temporary supports required for concrete sample panels, or mock-ups, or both, shall be designed by the Contractor's Engineer.

PART 2 - PRODUCTS

2.1 CONCRETE MATERIALS

- A. Water: Clean, potable, and free from deleterious material.
- B. Cementitious materials and aggregates:
 - 1. Proven history of successful use together, or submit evidence satisfactory to the Architect that aggregate will not react harmfully in presence of alkalis in cement.
 - 2. From constant sources throughout the work and of the same type and source as those used in establishing mix proportions.

- C. Portland cement: ASTM C 150, Type II, Low Alkali. Same brand and type of cement shall be used throughout.
- D. Fly ash: ASTM C 618, Class F, with the following modified requirements:
1. Chemical Requirements (Table 1 of ASTM C 618)
 - a. Sulfur trioxide (SO₃) shall not exceed 3% by weight.
 - b. Loss on ignition (L.O.I.): Maximum 1%.
 2. Physical Requirements (Table 2 of ASTM C 618)
 - a. Water requirement, maximum, 100% of control.
 3. Sulfate resistance, R = 0.75% maximum, where:
R = (C-5)/F, where:
C = Percent CaO (Calcium Oxide)
F = Percent Fe₂O₃ (Ferric Oxide)
- E. Ground Blast Furnace Slag: ASTM C 989.
- F. Aggregates:
1. Normal weight concrete: ASTM C 33, except as modified herein.
 - a. Coarse aggregates:
 - 1) Crushed limestone, granite, Clayton, Sechelt,
 - 2) Crushed gravel or gravel used as a gradation transition aggregate,
 - 3) Cleanness Value (CV) of not less than 75 when tested according to TransLab's California Test 227,
 - 4) Maximum aggregate size shall be determined by the Contractor for each class of concrete based on the parameters established in the specification subsection herein titled "Mix Designs".
 - b. Fine aggregates: Sand Equivalent (SE) of not less than 75 when tested according to TransLab's California Test 217.
 2. Lightweight concrete:
 - a. Coarse aggregates: ASTM C 330, expanded shale type, by rotary-kiln method,
 - b. Fine aggregates: ASTM C 33.
 3. Chloride ion content: Coarse and fine aggregates for use in concrete shall be thoroughly washed and cleaned such that their water-soluble chloride ion contents do not exceed the limitations established in the submitted concrete mix designs for each class of concrete.
- G. Admixtures: Admixtures containing chlorides, fluorides, sulphites, nitrates, or those that contain chemicals that may have a harmful effect on cement or aggregate, shall not be used. Combinations of admixtures in a given mix shall be chemically compatible. Acceptable admixture manufacturers include, but are not limited to W.R. Grace & Co., Master Builders, Euclid, and Sika & Co.
1. Water-reducing admixtures: ASTM C 494 Type A,
 2. Retarding admixtures: ASTM C 494 Type B,
 3. Accelerating admixtures: ASTM C 494 Type C, non-chloride,
 4. Water-reducing and retarding admixtures: ASTM C 494 Type D,
 5. Water-reducing and accelerating admixtures: ASTM C 494 Type E,

6. High-range water-reducing admixtures (superplasticizers): ASTM C 494 Type F,
7. High-range water reducing and retarding admixture: ASTM C 494 Type G,
8. Shrinkage-reducing admixture: W.R. Grace's "Eclipse", Euclid Chemical Company's "Eucon SRA", or equal,
9. Viscosity-modifying admixtures: Euclid Chemical Company's "Visctrol" or "Eucon ABS", W.R. Grace Company's "V-MAR 3", or equal,

2.2 CONCRETE ACCESSORIES

- A. Preformed expansion joint fillers: ASTM D 994, ASTM D 1751, or ASTM D 1752
- B. Expansive water stops for concrete construction joints: OCM's "Adeka Ultra Seal", Concrete Sealants' "CS-231", Greenstreak's "Leakmaster LV-1", or equal.
- C. Rock base below slabs on grade: Below interior slabs on grade use free draining, clean, crushed rock or gravel conforming to the requirements of Class 1, Type A permeable material as specified in Section 68 of the Caltrans Standard Specifications. Below exterior slabs-on-grade (where shown on the Structural Drawings) use crushed rock or gravel conforming to the requirements of Class 2 aggregate base, 3/4" maximum aggregate size, as specified in Section 26 of the Caltrans Standard Specifications.
- D. Vapor retarder: Flexible sheet membrane, minimum 15 mils thick, conforming to ASTM E 1745 Class C.
- E. Sand cover: Sand cover on top of vapor retarder shall not be used.
- F. Slab on grade bulkheads:
 1. Wood bulkheads with keys, as indicated on the Drawings.
 2. Preformed metal bulkheads specifically intended for slab on grade construction.
- G. Expanded polystyrene (EPS) below slabs on grade:
 1. Not subject to vehicular traffic: ASTM C 578.
 2. Subject to vehicular traffic: Extruded, ASTM C 578 Type VII or V with minimum density of 2.0 pcf and 60 psi minimum compressive resistance at 10% deformation.
- H. Cardboard fill below structural slabs above expansive soils shall be SureVoid's "SlabVoid", or VoidForm International's "FloorVoid", or equal.
- I. Evaporation reducing compounds: Film-forming compound for temporary protection from rapid moisture loss. Acceptable products include "Conform" by BASF, "Eucobar" by Euclid Chemical Co., or equal.

2.3 CONCRETE MIX DESIGNS

- A. General:
 1. Concrete mix designs shall be designed and documented by the Contractor's Engineer.
 2. The Contractor shall review proposed concrete mix designs for compatibility with the intended placement requirements, including reinforcement layout, to ensure that the concrete, as designed, can be placed in accordance with the Contract Documents.

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3. The proportions of the concrete mixes shall be such as to produce concrete for each class of concrete that conforms to the specified minimum compressive strength, and, where required, drying shrinkage, permeability, and thermal control limits, within the specified maximum water-cementitious materials ratio.
4. Aggregate size and gradation shall be determined by the Contractor, within the established limitations.
 - a. The size and grading of aggregates shall be such that it will produce dense and uniform concrete free from rock pockets, honeycombs and other irregularities. The maximum size of aggregates for each class of concrete shall not be more than:
 - 1) 1/5 the narrowest dimension between faces of forms,
 - 2) 1/3 the depth of slabs,
 - 3) 3/4 the minimum clearance between the closest spaced reinforcement bars,
 - 4) The minimum required concrete cover,
 - 5) 1 1/2".
 - b. Aggregate gradation shall meet the limits of ASTM C 33.
5. Determination of the amount of water in the batch shall include water contained in the aggregates.
6. The slump of wet concrete, measured at the delivery point, shall be determined and designed by the Contractor.
 - a. Acceptable slump tolerances shall be as established in ASTM C 94, with the exception that slump tolerances for concrete mixes with a minimum 45% cement replacement by pozzolans may be double the listed values.
7. The plastic concrete consistency shall allow thorough compaction of the concrete into formwork corners and around concrete reinforcement without excessive puddling, spading, or vibration, and without causing the mixed materials to segregate or causing free water to collect on horizontal concrete surfaces.
8. The maximum percent water-soluble chloride ion content measured by weight of cement from the composite sum of concrete ingredients for each class of concrete shall be calculated for the concrete mix design proposed for each class of concrete. Where total calculated chloride ions exceed the CBC limits, either historic data or trial test batch data shall be submitted demonstrating that the water-soluble chloride ion content in each respective concrete mix does not exceed the allowable limits. Foundation members, slabs on grade, below grade walls, and buried roof structures shall be considered as concrete in wet conditions.

B. Normal Weight Concretes:

1. Aggregates: At the Contractor's option, up to 25% of coarse aggregates may be gravel or crushed gravel, as measured by weight.
2. Air content: 2% maximum air content measured by volume.
3. Unit weight: Wet and dry unit weight shall be calculated in conformance with ASTM C 138 and ASTM C 567, respectively. Maximum unit dry weight shall be between 147 and 153 pounds per cubic foot (pcf).
4. Cement replacement: Replacement of a portion of Portland cement by flyash and/or ground blast furnace slag is allowed for all classes of concrete with a maximum allowable replacement of 60%.

5. Normal weight concrete mixes shall be designed in accordance with the following requirements:

NORMAL WEIGHT CONCRETE MIX REQUIREMENTS (Note 1)							
Concrete Class	Concrete Elements	Performance Criteria				Limiting Parameters	Additional Notes
		Minimum Compressive Strength (psi) (Note 2)	28-Day Maximum Drying Shrinkage Percentage (Note 3)	28-Day Maximum Permeability (Coulombs) (Note 4)	Mass Concrete Requirements (Note 5)	Maximum Water to Cementitious Materials Ratio (W / CM) (Note 6)	
A	Footings, grade beams	4,000	N/A	N/A	N/A	0.45	8
B	Interior slabs on grade	3,000	N/A	N/A	N/A	0.45	-
C	Exterior slabs on grade	3,000	N/A	N/A	N/A	0.45	-
D	Walls, columns	4,000	N/A	N/A	N/A	0.40	
E	Fill on metal deck	4,000	N/A	N/A	N/A	0.45	-

Notes:

1. N/A stands for "not applicable".
2. Compressive strength shall be determined on the basis of field experience and trial mixtures as required in the CBC. Specifications are based on developing compressive strength achieved at 28 days. Greater times to achieve specified compressive strength are allowed provided formwork stripping times are adjusted accordingly. Time to achieve specified compressive strength shall not exceed 56 days.
3. Drying shrinkage limit shall be verified by either historic data or trial batch test specimens prepared and measured in accordance with ASTM C 157 from concrete prepared in laboratory conditions in accordance with ASTM C 192.
4. Permeability limit listed above shall be validated by either historic data or trial batch test specimens prepared and measured in accordance with ASTM C1202 from concrete prepared in laboratory conditions in accordance with ASTM C192.
5. Mass concrete requirements: Maximum concrete temperature during curing = 180 degrees Fahrenheit, maximum temperature differential between interior and exterior concrete = 35 degrees Fahrenheit. Thermal requirements shall be verified by either historic data or trial batch test specimens; or by preparing and submitting a Thermal Control Plan for review.
6. W = weight of water. CM = weight of cementitious materials (cement plus flyash and/or ground blast furnace slag). Any mix that uses greater than 45% cement replacement shall have a maximum W/CM of 0.38.
7. The mix design submittal for this class of concrete shall include evidence that the proposed mix meets each of the required performance criteria listed above through either trial batch test data or historic data for the exact mix to be used on this project.
8. Cement replacement: Mix shall contain a minimum of 50% and a maximum of 60% replacement of Portland cement by flyash and/or ground blast furnace slag.

C. Lightweight Concretes:

1. Air content: 4% to 7% air content measured by volume.

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2. Unit weight: Wet and dry unit weight shall be calculated in conformance with ASTM C 138 and ASTM C 567, respectively. Maximum unit dry weight shall be between 107 and 113 pounds per cubic foot (pcf).
3. Lightweight concrete mixes shall be designed in accordance with the following requirements:

LIGHTWEIGHT CONCRETE MIX REQUIREMENTS (Note 1)							
Concrete Class	Concrete Elements	Performance Criteria				Limiting Parameters	Additional Notes
		Specified Compressive Strength (psi) (Note 2)	Maximum Drying Shrinkage Percentage (Note 3)	Permeability (Coulombs) (Note 4)	Mass Concrete Requirements (Note 5)	Maximum Water to Cementitious Materials Ratio (W / CM) (Note 6)	
N	Fill on Metal Deck	3,000	N/A	N/A	N/A	0.50	-

- D. Notes: See notes for normal weight concrete mixes above.

PART 3 - EXECUTION

3.1 PROTECTION OF MATERIALS

- A. Protect materials from damage, weather, and contaminants such as grease, oil, and dirt.

3.2 COORDINATION

- A. Coordinate locations and sizes of penetrations and openings in concrete members and verify conformance to structural requirements shown on the Drawings.

3.3 TOLERANCES

- A. Dimensional tolerances shall be in conformance with ACI 117.

3.4 PREPARATION

- A. Wood chips, shavings, and other debris shall be removed from the interior of the forms.
- B. Existing and previously placed concrete surfaces shall be prepared as required herein.
- C. Reinforcement shall be cleaned, if necessary, prior to placing concrete.
- D. Reinforcement and other work to be embedded in the concrete shall be secured in position before casting.

- E. Anchor bolts shall be accurately set to line and grade and shall be securely held in position such that they are not displaced while concrete is being place.
- F. Pipes or conduits passing through (perpendicular to) structural concrete grade beams, joists, beams, girders, slabs, and walls shall be sleeved in Schedule 40 galvanized carbon steel or PVC sleeves as detailed on the Drawings. Adjacent pipes or conduits, passing through structural concrete, shall be spaced not less than three diameters on center and shall not displace concrete reinforcement, unless otherwise shown on the Drawings. Pipes and conduit shall not pass parallel inside of structural members except as specifically allowed in slabs and walls in this specification.
- G. Electrical conduit runs in structural concrete slabs and walls, where specifically indicated as acceptable on the Drawings, shall be limited to one inch nominal conduits placed with a maximum of two crossing layers spaced at a minimum of 6 conduit diameters on center.
- H. Electrical conduit shall not be allowed in concrete fill on metal deck.
- I. Forms and existing concrete and masonry surfaces shall be thoroughly wetted immediately before casting.
- J. Freestanding water shall be removed from forms and groundwater diverted from forms and excavations.

3.5 MIXING CONCRETE

- A. Concrete shall be ready-mixed concrete and shall be mixed in accordance with ASTM C 94.
- B. Concrete shall be mixed with quantities and ingredients conforming to the approved mix designs. Ingredients shall be proportioned by weight.
- C. Mixed concrete shall be homogeneous in distribution of material and uniform in consistency and color. Concrete shall be mixed for at least 10 minutes after ingredients have been added, and three minutes of this time must be immediately prior to discharging at the job site. Mixed concrete shall be placed in forms within 90 minutes from the time of combination of cement and water. When air temperature is between 85 and 90 degrees F (30 and 32 degrees C), reduce mixing and delivery time to 75 minutes; when air temperature is above 90 degrees F (32 degrees C), reduce mixing and delivery time to 60 minutes.
- D. Addition of admixtures shall be in accordance with manufacturer's recommendations and under the review of the District's Testing Agency.

3.6 TRANSPORTING

- A. Transport of concrete shall be in accordance with ASTM C 94.

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3.7 CONVEYING

- A. Concrete shall be handled from the mixer to the place of final deposit as rapidly as practicable by methods that prevent the separation or loss of the ingredients. Deposit concrete as near as practical to its final position to avoid re-handling or flowing. Concrete shall not be dropped freely where reinforcement or embedments will cause segregation, and in no case shall it be dropped more than six feet. Spouts, elephant trunks, or other acceptable means shall be used to prevent segregation.
- B. At the Contractor's option, concrete may be pumped from the transit mixer to place of deposit provided that submitted mix designs reflect selection of pumping methods. Pumps shall be adequate for the mix, aggregate size, and slump.

3.8 PLACING

- A. A record shall be kept of the time and date of placing the concrete in each portion of the structure. Such reports shall be kept until the completion of the structure and shall be open to the inspection of the Architect and District's Testing Agency.
- B. Concrete shall not be placed under water.
- C. Concreting, once started, shall be carried on as a continuous operation until the section of acceptable size and shape is completed. Construction joints must be of acceptable detail and location.
- D. Concrete shall be so deposited as to maintain, until the completion of the unit, a plastic surface approximately horizontal. No concrete shall be deposited that has started to set or stiffen. The remixing or retempering of concrete that has begun to set shall not be permitted.
- E. Concrete, when placed in walls, shall not be placed in layers exceeding two feet in depth. Schedule of pouring shall be such that no concrete layer takes initial set before the next layer is placed. Concrete placement shall be scheduled such that horizontal joints in exposed exterior walls are located where shown on the Drawings without exception.
- F. At least two hours must elapse after depositing concrete in walls or columns before depositing concrete in supported beams or slabs above.
- G. Reinforcement, inserts, anchor bolts, welding plates, or other embedded items shall be prevented from shifting or displacing during or after concrete placement.
- H. Concrete spilled on forms or reinforcement in portions of structure not immediately concreted, shall be completely removed before the concrete sets.
- I. Concrete shall be placed in such a manner as to prevent staining or splattering of completed work.
- J. Interruption in placement of concrete exceeding 90 minutes will be cause for stopping placement of further concrete in the affected areas. Remaining mixed concrete in hoppers or mixers shall not be placed. In case such interruption occurs, the Contractor shall provide construction joints, where and as directed, and cut concrete back to such line, cleaning forms and reinforcement as herein specified.

- K. Placement of subsequent, adjacent concrete shall be staggered a minimum of 48 hours.
- L. Conveyors, trucks, or buggies must be thoroughly cleaned after each pour.

3.9 HOT WEATHER PLACING:

- A. During hot weather, procedures for mixing, transporting, and placing concrete shall conform to ACI 305.

3.10 COLD WEATHER PLACING:

- A. During cold weather, procedures for mixing, transporting, and placing concrete shall conform to ACI 306.

3.11 CONSOLIDATION

- A. Consolidation of concrete shall be in conformance with ACI 309. Concrete shall be thoroughly compacted by puddling with suitable tools during placing, and thoroughly worked around the reinforcement, around embedded fixtures and into the corners of the forms. In addition to manual spading and tamping, concrete shall be internally vibrated with high-speed mechanical vibrators. A mechanical vibrator shall be utilized at each point of placement.
- B. Vibration shall be sufficient to minimize honeycombs and accomplish compaction of concrete. Do not over-vibrate as this can result in loss of entrained air or excess of fines at the concrete surfaces. In the event, during concrete placement, there is a delay of more than fifteen minutes between lifts, manipulate previously placed concrete with vibrators just prior to placement of fresh concrete.

3.12 FINISHING

- A. See section titled, "Concrete Finishing".

3.13 CURING

- A. See section titled, "Concrete Curing".

3.14 CONSTRUCTION JOINTS, KEYS, CONCRETE INTERFACES

- A. Construction joints:
 - 1. Location of construction joints shall be as shown on the Drawings. If not shown on the Drawings the following maximum distances between construction joints shall be used: 100 feet for continuous footings and grade beams, 60 feet for walls.
 - 2. Construction joints not indicated on the Drawings shall be made and located so as not to impair the strength of the structure. Vertical construction joints in joists, beams, girders, and slabs shall be located in the middle third of the member span.

CAST-IN-PLACE CONCRETE

3. Reinforcement through construction joints: Extend concrete reinforcement continuously through construction joints unless otherwise shown on the Drawings. Reinforcement extensions beyond construction joint locations shall be long enough to provide the scheduled lap splice length shown on the drawings, unless mechanical couplers are utilized.
4. Construction and control joints for slabs on grade shall be located as shown on the Drawings. Concrete placement in adjacent pours shall be staggered a minimum of 48 hours. Construction and control joints shall be keyed as detailed on the Drawings.
 - a. Where slab on grade construction joints are not shown on the Drawings, the maximum distance between construction joints shall be 15 feet for 5 inch thick slabs, 18 feet for 6 inch slabs, and 21 feet for 7 inch thick slabs. Maximum length-to-width ratio shall be 1.5 to 1.

B. Keys:

1. Keys shall be provided across vertical construction joints in girders, beams, slabs, walls, and other members, as detailed on the Drawings. Horizontal construction joints across joists, beams, girders, and slabs shall not be allowed unless otherwise shown on the Drawings.
2. Keys shall be provided across horizontal construction joints in walls and columns, as shown on the Drawings. Vertical construction joints shall not be allowed in columns or pilaster members, unless otherwise shown on the Drawings.

C. Concrete Interfaces:

1. Prior to placement of concrete against previously placed concrete, the previously placed concrete surfaces shall be cleaned and roughened. Surface shall be roughened utilizing sandblasting or other acceptable means. Uniformly expose the face of coarse aggregates embedded in the concrete mortar matrix.
2. Prior to placement of concrete against existing concrete, the existing concrete surfaces shall be free from loose concrete and laitance, cleaned, and roughened. Prepared surfaces shall meet the criteria established above for concrete placed against previously placed concrete.

3.15 SAW-CUT JOINTS

- A. Saw-cut as soon as concrete has hardened sufficiently to prevent aggregates being dislodged by saw.
- B. Perform all cuts cleanly and smoothly to a constant and equal depth in as continuous an operation as possible to avoid misalignment of joints. Use only experienced personnel and forms or templates as required to achieve consistent lines.

3.16 SLABS ON GRADE AND UNDERLAYMENTS

- A. Rock base beneath interior slabs on grade shall be lightly tamped. Rock base under exterior slabs on grade (where shown on the Structural Drawings) shall be compacted in accordance with Section 26 of the referenced CalTrans Standard Specifications. Rock bases shall be a minimum of 6" thick.

- B. Install, splice, seal, and patch the vapor retarder over the rock base beneath interior slabs on grade, and elsewhere as indicated on Drawings, in conformance with ASTM E 1643 and the manufacturer's recommendations.
 - 1. The vapor retarder membrane shall be continuous at slab-on-grade construction joints.
 - 2. Overlap adjacent edges of vapor retarder membrane sheets a minimum of 6 inches, or more as recommended by manufacturer, and seal.
 - 3. Penetrations through vapor retarders, such as staking holes for slab on grade construction joint bulkheads, other than penetrations for permanent utilities shall not be permitted.
 - 4. Vapor retarder penetrations shall be allowable only at utilities such as pipes and conduits. Seal the retarder membrane around the penetration to the utility.
 - 5. Seal vapor retarder membrane sheets to the face of concrete foundation elements, walls, and columns. Vapor retarder membranes shall not interrupt or pass through concrete construction joints.
 - 6. Repair damaged membrane locations with sealed membrane patches overlapping damaged area a minimum of 6 inches or more if recommended by manufacturer.
- C. Screed supports for concrete slabs on grade placed over vapor retarders or waterproofing membranes shall be of cradle, pad, or base type that will not puncture the vapor retarder or waterproofing membrane.

3.17 EXAMINATION

- A. Immediately after removing forms, concrete surfaces shall be examined for defects.

3.18 TIE HOLE FILLING

- A. Form tie holes in concrete surfaces shall be plugged to effectively seal form tie metal from moisture, unless otherwise shown on the Drawings or when directed by the Architect.

3.19 PROTECTION

- A. Protect cast concrete from damage from construction and weather.
- B. Wheeling, working and walking on concrete shall be avoided for at least 24 hours after casting. Cover traffic areas with plywood or utilize other suitable means as necessary to protect concrete from damage.
- C. Protect concrete during and after curing from damage during subsequent construction operations.
- D. Concrete shall not be subjected to loads unless those loads are resisted directly by shoring until concrete has attained its specified compressive strength (but no sooner than 14 days after casting) and until curing operations have been completed.
- E. Self-supporting structures shall be protected from mechanical disturbances and shall not be loaded in such a manner as to overstress the concrete.

CAST-IN-PLACE CONCRETE

3.20 ACCEPTANCE CRITERIA

- A. Concrete shall meet the following acceptance criteria:
 - 1. Concrete shall conform to the established tolerances.
 - 2. Concrete shall meet the established performance criteria.
 - 3. Concrete shall be free from voids, rock pockets, cracks, pour joints, spalls, honeycombs, and air bubbles that adversely affect the structural adequacy.

3.21 CORRECTION OF DEFECTIVE WORK

- A. Correction of defective work shall be the responsibility of the Contractor.
- B. Work not in compliance with the requirements of the Contract Documents shall be considered defective, unless otherwise directed in writing by the Architect.
- C. Corrected work shall conform to the requirements of the Contract Documents.
- D. The Contractor shall prepare a submittal documenting the defective work and proposed corrections and submit to the Architect for review. The submittal shall include a description of the defective work, the location of defective work, and shall be accompanied by supporting sketches, photographs, or both. Additionally, the submittal shall include similar documentation of the Contractor's proposed corrections.
- E. Correction of defective work shall not commence until the Architect has reviewed and accepted the submittal.
- F. Correction of defective work shall be inspected by the District's Testing Agency.

3.22 CLEAN-UP

- A. Remove from the site all debris resulting from the work of this Section.

- END OF SECTION -

- SECTION 03 3500 -

CONCRETE FINISHING

PART 1 - GENERAL

1.1 RELATED INFORMATION AND REQUIREMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, specific Specification Sections listed below, and all other Specification Sections apply to this Section.
 - 1. Concrete Forming
 - 2. Concrete Reinforcing
 - 3. Cast-In-Place Concrete
 - 4. Concrete Curing

1.2 SECTION INCLUDES

- A. Construction: Provide material, labor, equipment, services, tests and inspections necessary for the finishing of cast-in-place concrete and shotcrete.

1.3 REFERENCE DOCUMENTS

- A. Standards: Comply with the provisions of the documents listed below and with the requirements described in this Section. Use current editions of documents unless earlier editions are specifically referenced by the governing code or are otherwise indicated.
 - 1. CBC – 2007 California Building Code.
 - 2. ACI - American Concrete Institute, Manual of Concrete Practice, including, but not limited to, the following sections:
 - a. ACI 117 " Standard Specifications for Tolerances for Concrete Construction and Materials".
 - b. ACI 301 "Specification for Structural Concrete for Buildings".
 - c. ACI 302.1R "Guide for Concrete Floor and Slab Construction".
 - 3. ASTM, American Society for Testing and Materials, designations referenced herein.

1.4 SUBMITTALS

- A. General: Submittals shall be sent to the Architect, or District's Testing Agency, or both, as required herein for review prior to commencing the work. Review of submittals covers the general character of the details and to verify compliance with the performance requirements. Review does not cover checking of quantities, proportions or dimensions. Such review shall not relieve the Contractor from responsibility for executing the work in accordance with the Contract Documents.
- B. Product Data: The Contractor shall submit manufacturer's data to the Architect for review.
- C. Sample panels: Refer to specification titled "Cast-in-Place Concrete" for sample panel submittal requirements.
- D. Mock-up: Refer to specification titled "Cast-in-Place Concrete" for mock-up submittal requirements.

1.5 TESTS AND INSPECTIONS

- A. Notification:
 - 1. The Contractor shall notify the District's Testing Agency of work to be tested and inspected. Notification shall be sufficiently in advance to allow scheduling of tests and inspections, but not less than 24 hours.
 - 2. The Contractor shall immediately notify the Architect if the District's Testing Agency indicates that quality assurance tests and inspection requirements have not been met.
- B. District's Quality Assurance Tests and Inspections:
 - 1. General: Quality assurance tests and inspections shall be the responsibility of the District. The District shall retain a testing agency, referred to herein as the District's Testing Agency, who shall perform the required tests and inspections, prepare written summary reports of tests and inspections, and review submittals.
 - 2. Formed Surface Finish: Inspect cast finish of formed surfaces for compliance with applicable class A, B, or C surface as defined in ACI 117.
 - 3. Slab Finish Tolerance: Measure slab tolerance by 10-foot straightedge or measure floor flatness and levelness by ASTM E 1155 to confirm that specification limits herein have been satisfied.

PART 2 - PRODUCTS

2.1 PRODUCTS

- A. Evaporation reducing compounds: Film-forming compound for temporary protection from rapid moisture loss. Acceptable products include "Confilm" by BASF, "Eucobar" by Euclid Chemical Co., or equal.
- B. Slip-resistive aggregate: Factory graded, rustproof, non-glazing, and unaffected by cleaning materials. Acceptable products include "Frictex NS" by Sonneborn-Contech, "Fut-Sure" by General Abrasive Company, or equal.

PART 3 - EXECUTION

3.1 PROTECTION OF MATERIALS

- A. Protect materials from damage, weather, and contaminants such as grease, oil, and dirt.

3.2 FINISHES FOR FORMED SURFACES

- A. General: Perform subsequent finishing operations as soon as practical after stripping formwork, except as specifically noted.
- B. Rough Form Finish: As cast finish obtained using rough form finish formwork. Repair honeycombed areas, fill tie holes and defects, and remove fins, offsets, and projections exceeding 1/4 inch.
- C. Smooth Form finish: As cast finish obtained using smooth form finish formwork. Repair honeycombed areas, fill tie holes and defects, and remove and smooth all fins, offsets, and projections.

3.3 SHOTCRETE FINISHES - NOT APPLICABLE

- ~~A. Natural rod finish: Natural rod finish shall be finish obtained by slicing off excess shotcrete outside of forms and ground wires with a sharp-edged cutting screed after the surface has reached initial set. Remove ground wires and remove wire impressions by floating.~~
- B. Steel trowel finish:
 - ~~1. Slice off excess shotcrete outside of forms and ground wires with a sharp-edged cutting screed after the surface has reached initial set.~~
 - ~~2. Immediately after screeding apply thin shotcrete flash coat, containing finer than normal sand, by holding nozzle well back from work. Flash coat shall be followed by a steel trowel finish to true planes with a tolerance of a maximum deviation of 1/4" per 10 ft. when measured with a straightedge.~~

3.4 SLAB FINISHES

- A. General: Follow ACI 302.1R recommendations for screeding, floating, restraightening, and finishing operations for slabs.
- B. Evaporation Control: Protect concrete from rapid moisture loss before and during finishing operations. Apply evaporation control material prior to the commencement of finishing operations and periodically during finishing as needed. Do not apply water to the slab surface prior to the completion of finishing operations.
- C. Measurement of Slab Tolerances: Measure slab finish tolerances within 72 hours after slab finishing and before removal of supporting formwork or shoring. Use the specified method and tolerance listed for each type of finish.
- D. Scratch Finish: Screed and bullfloat concrete surface. Roughen the surface with stiff brushes or rakes to produce a profile of 1/4 inch in one direction before final set of concrete.

1. Finish Tolerance: 1/2 inch in 10 feet measured by "10-ft straightedge method" in ACI 117.
- E. Float Finish: Screed and bullfloat concrete surface. Consolidate surface with power-driven floats or by hand floating if area is too small or inaccessible by power-driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.
 1. Finish Tolerance: 5/16 inch in 10 feet measured by "10-ft straightedge method" in ACI 117.
- F. Light Trowel Finish: Apply float finish. Consolidate concrete surface by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks, uniform in texture, and planed to the specified tolerance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
 1. Finish Tolerance:
 - a. When slab is not sloped and total project area is greater than 10,000 square feet, use the F-number system as measured by ASTM E 1155 with tolerances as follows:
 - 1) Flatness: Overall F(F) 30; with a minimum local value of F(F) 24.
 - 2) Levelness: Overall F(L) 20; with a minimum local value of F(L) 15.
 - b. Otherwise, use 3/16 inch in 10 feet measured by "10-ft straightedge method" in ACI 117.
- G. Hard Trowel Finish: Apply light trowel finish. Continue hand troweling until a ringing sound is produced as the trowel is moved over the surface. Final hand-troweling shall leave finished surface free of trowel marks, uniform in texture and appearance, and planed to the specified tolerance.
 1. Finish Tolerance:
 - a. When slab is not sloped and total project area is greater than 10,000 square feet, use the F-number system as measured by ASTM E 1155 with tolerances as follows:
 - 1) Flatness: Overall F(F) 30; with a minimum local value of F(F) 24.
 - 2) Levelness: Overall F(L) 20; with a minimum local value of F(L) 15.
 - b. Otherwise, use 3/16 inch in 10 feet measured by "10-ft straightedge method" in ACI 117.
- H. Broom Finish: Apply float finish. Lightly steel trowel to remove irregularities. Roughen surface by drawing a fiber bristle broom, not less than 24 inches wide, across surface perpendicular to main traffic route. Produce even texture from edge to edge, lapping adjacent strokes slightly to produce a uniform pattern.
 1. Finish Tolerance: 5/16 inch in 10 feet measured by "10-ft straightedge method" in ACI 117.
 2. Obtain Architect's approval for texture of final finish before application.
- I. ~~Swirl Finish: Apply float finish. Hand float using a wood float to produce a continuous swirl patterned surface, free from porous and rough spots that may be produced by disturbing particles of coarse aggregate embedded near the surface.~~
 1. ~~Finish Tolerance: 5/16 inch in 10 feet measured by "10-ft straightedge method" in ACI 117.~~
 2. ~~Obtain Architect's approval for texture and pattern of final finish before application.~~

CONCRETE FINISHING

- J. Slip-Resistive Finish: Apply float finish. Before final floating, apply slip-resistive aggregate according to manufacturer's written instructions. Minimum rate of application shall be 25 pounds per 100 square feet. Follow spreading and tamping of slip-resistive aggregate with a final float and apply a light trowel finish.
1. Finish Tolerance: 5/16 inch in 10 feet measured by "10-ft straightedge method" in ACI 117.

3.5 FINISH SCHEDULE

- A. The concrete finish types specified in the tables below shall be used except as otherwise shown on the Drawings.
- B. Refer to the section titled "Concrete Forming" for formwork requirements.

Table 1: Finishes for Formed or Shotcrete Surfaces		
Surface Type	Formed Concrete Surfaces	Un-formed Shotcrete Surfaces
Concealed	Rough Form Finish	Natural Rod Finish
To receive waterproofing or cement plaster	Smooth Form Finish	Steel Trowel Finish
Pits (inside face)	Smooth Form Finish	Steel Trowel Finish
Exposed to view, building interior, unless otherwise noted	Smooth Form Finish	Steel Trowel Finish
Exposed to view, mechanical rooms and storage areas	Smooth Form Finish	Steel Trowel Finish
Exposed to view, slab soffits	Smooth Form Finish	Not Applicable
Architectural Concrete Surfaces	Architectural Concrete Finish	Architectural Shotcrete Finish

Table 2: Slab Finishes	
Surface Type	Finish
To receive carpet, resilient flooring, or thin-set tile	Light Trowel
To receive bonded topping or mortar bed	Scratch
To receive unbonded topping, terrazzo, or wood flooring	Float
To receive built-up waterproofing	Float
To receive fluid applied waterproofing	Light Trowel
Exposed to view, mechanical rooms and storage areas	Hard Trowel
Exposed to view, building interior	Hard Trowel
Exposed to view, ramps, stair landings, and treads	Slip-Resistive
Parking surfaces	Swirl
Exterior	Broom

3.6 CORRECTION OF DEFECTIVE WORK

- A. Correction of defective work shall be the responsibility of the Contractor.
- B. Work not in compliance with the requirements of the Contract Documents shall be considered defective, unless otherwise directed in writing by the Architect.
- C. Corrected work shall conform to the requirements of the Contract Documents.
- D. The Contractor shall prepare a submittal documenting the defective work and proposed corrections and submit to the Architect for review. The submittal shall include a description of the defective work, the location of defective work, and shall be accompanied by supporting sketches, photographs, or both. Additionally, the submittal shall include similar documentation of the Contractor's proposed corrections.
- E. Correction of defective work shall not commence until the Architect has reviewed and accepted the submittal.
- F. Correction of defective work shall be inspected by the District's Testing Agency.

3.7 CLEAN-UP

- A. Remove from the site all debris resulting from the work of this Section.

- END OF SECTION -

- SECTION 03 3570 -

WATER VAPOR EMISSION CONTROL SYSTEM

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 environmentally safe, synthetic or plural polymer type barrier to form a water vapor emission and alkalinity control interface for finished floor coverings. Barrier shall be resistant to mold, mildew and biological growth when applied to prepared substrates.
 - 1. Provide over all interior concrete slabs where floor coverings are scheduled to be installed, as specified.
- B. Include in Contract Sum the cost for pre and post-installation testing of the concrete slab in accordance with ASTM F-1869 on the interior concrete area of the building slab to receive a floor covering or coating as follows: Three test kits for the first 1,000 sq. ft. and one test kit for each 1,000 sq. ft. thereafter.

1.3 RELATED SECTIONS

- A. Section 01 4523 "Testing and Inspection" for independent laboratory testing of floor slabs.
- B. Section 01 81 13 "LEED Certification Requirements".
- C. Section 03 3000 "Cast-in-Place Concrete" for concrete slab substrate.
- D. Section 06 6466 "Wood Athletic Flooring" for installation of wood athletic flooring.
- E. Section 09 6500 "Resilient Flooring" for installation of resilient floor covering.
- F. Section 09 6566 "Rubber Athletic Flooring" for installation of resilient athletic flooring.
- G. Section 09 6816 "Sheet Carpet" for installation of broadloom carpet directly adhered to the concrete floor surfaces.

1.4 SYSTEM DESCRIPTION

- A. Prescribed treatment system utilizing a water based polymer multi-coat, non-corrosive, low viscosity, high gloss, microbial resistant, moisture-alkaline resistant polymer system to suppress, control and mechanically restrict up to 10.0 lbs. of water emission and a pH level of 14 in concrete substrates for compliance with subsequent floor coverings or coating materials. In the event levels are above specified system rates, a system upgrade is required by change order.
- B. Performance Requirements: It is the intention of this section and the drawings to form a guide for a complete barrier system. Any items not specifically noted but necessary for a complete barrier system shall be provided under this section.
 - 1. System shall be compatible with all types of floor covering products, no system failures due to improper installations and contain no water/alkaline soluble compounds.
 - 2. System shall have a sufficient density to reduce water vapor transmission, avoid water vapor damage to other adhered systems and resistant to most commonly encountered acids/solvents in case of topical exposure (spills).

1.5 REFERENCES

- A. American Concrete Institute:
 - 1. ACI 318 – Building Code Requirements for Structural Concrete.
- B. ASTM International:
 - 1. ASTM D1308 – Standard Test Method for Effort of Household Chemicals on Clear and Pigmented Organic Finishes.
 - 2. ASTM D4541 – Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers.
 - 3. ASTM E96 – Standard Test Methods for Water Vapor Transmission of Materials.
 - 4. ASTM F710 – Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
 - 5. ASTM F1869 – Standard Test method for Measuring Moisture Vapor Emission Rate of Concrete Subflooring Using Anhydrous Calcium Chloride.
- C. EPA Method 24 VOC Content Testing.

1.6 SUBMITTALS

- A. Section 01 3219 “Submittal Procedures” for submittal procedures.
- B. Manufacturer:
 - 1. Product Data: Detailed installation requirements, spread rates, joint and crack treatment and final barrier surfaces for floor coverings.
 - 2. ASTM Reports: Certified laboratory reports for specified ASTM performance.
 - 3. Environmental: Manufacture certified letter for material VOC content.

4. Extended Warranty Certificate: Manufactures standard 15 year warranty for manufacturing defects and on site material performance. Warranty shall not list ACI-318 compliance exclusions.
 5. Field Documents: Manufactures written acceptance of on site conditions including environmental conditions, concrete mix design, admixtures, concrete salts, sub slab vapor barrier, curing methods, concrete surface strength prior to application.
 6. Post-Testing: Moisture testing results prior to floor coverings per ASTM F 1869.
- C. LEED Submittal: See Section 018113 LEED Certification Requirements for the following:
1. EQc4.2 Paints & Coatings: Product data for paints & coatings, including printed statement of VOC content and chemical components.
- D. Installer: Factory licensed, approved, certified applicator certificate.

1.7 WARRANTY

- A. Extended Warranty: Written warranty, signed by manufacturer agreeing to repair control system that does not maintain a water vapor emission rate of 2.5 lbs. (± 0.50) per ASTM F 1869 and alkalinity of less than 9.0pH for a period of fifteen (15) years.
1. Warranty shall include the replacement of control system, flooring system, patching compounds, installation accessories flooring materials and labor costs.
 2. Warranty shall not exclude or become void due to non-conformance to ACI-318 parameters, dew-point, concrete salts, admixtures, resin and silicate surface treatments or cohesive substrate failure in the concrete surface due to normal concrete movement. Installation on slab surfaces deems acceptance of on site conditions.
 3. Warranty may exclude unforeseen Alkali-silica reaction or Alkali-aggregate conditions as outlined by ACI-212, seismic action and flooding. Manufacturer is responsible for complete review of concrete mix designs, admixtures, sub-slab vapor retarder installed and curing methods for written acceptance prior to installations.

PART 2 - PRODUCTS

2.1 WATER VAPOR EMISSION CONTROL SYSTEM

- A. Subject to compliance with requirements, provide one of the following barriers:
1. Synthetic10 by Synthetics International, Irvine, CA, tel: (866) 646-0356, web: www.SyntheticsIntl.com (Base Design Intent)
 2. Vapor Remediation System by Diamond Stone Products, Phoenix, AZ, tel: 888-81-STONE web: www.diamondstoneproducts.com
 3. System II by Floor Seal Technology, San Jose, CA, tel: (800) 572-2344 web: www.floorseal.com

2.2 MATERIALS

- A. Type: Water based, polymer penetrant
 - 1. Ultra low viscosity, VOC compliant, low odor, non-corrosive, microbial resistant and elastomeric properties to expand and contract with slab movement; formulated to saturate concrete surfaces and mechanically restrict moisture and alkalinity levels, and conforming to the following:

CERTIFIED INDEPENDENT LAB PERFORMANCE

Physical property, units	Test Method	Acceptable value
Water Vapor Transmission	ASTM E 96	75 – 95% Vapor Reduction
Alkali resistance	ASTM D 1308	Resistant to 30 day exposure, 14pH
Adhesion strength, psi	ASTM D 4541	400 - 600, (100% concrete failure)
VOC Content Testing	EPA Method 24	49 – 70 gram per liter

2.3 ACCESSORIES

- A. Cementitious Surface: Manufacturer approved, Portland cement based compound for a smooth, non-shrink, durable surface meeting a compressive strength of not less than 3,600psi per ASTM C 109.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Site Verification: Verify substrate conditions are acceptable for a warranted system.
- B. Substrate Testing: Perform calcium chloride testing in accordance with ASTM F 1869. Apply one test per 1,000 square feet and document results on a locations map for Architects review.

3.2 PREPARATION

- A. Protection: Mask and protect walls, equipment from adjacent work and finishes during installation process.
- B. Scarification: Scarify slab surfaces, grind near walls and clean joints as required to control system installation.
- C. Cleaning: Broom-sweep and vacuum slab surfaces to remove contaminates.

WATER VAPOR EMISSION CONTROL SYSTEM

- D. Joints & Cracks: Fill cracks, joints, and surface irregularities with flexible non-shrink moisture-alkaline resistant layer.

3.3 INSTALLATION

- A. Apply control system over entire substrate to yield required water vapor emission rates by manufacturer employed personnel, certified and approved applicator.
- B. Allow surfaces to cure to the touch and re-apply are required to form a uniform control layer
- C. Install cementitious materials approved by manufacturer.

3.4 FIELD QUALITY CONTROL

- A. Manufacture and installer to guarantee installed treatment system is compatible with all specified floor coverings.
- B. Post Testing:
 - 1. Allow control system to cure for a 48 hour period.
 - 2. Provide post testing to guarantee moisture reduction, in accordance with ASTM F-1869 as schedule permits. Install three test kits for the first 1,000 sq. ft. and one test kit for each 1,000 sq. ft. thereafter.
 - 3. In the event moisture levels are above 2.5 lbs. (± 0.50), manufacturer and installer shall provide additional materials and labor to reduce levels at no additional charge to Owner.

- END OF SECTION -

- SECTION 03 3900 -

CONCRETE CURING

PART 1 - GENERAL

1.1 RELATED INFORMATION AND REQUIREMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, specific Specification Sections listed below, and all other Specification Sections apply to this Section.
 - 1. Concrete Forming
 - 2. Concrete Reinforcing
 - 3. Cast-In-Place Concrete
 - 4. Concrete Finishing

1.2 SECTION INCLUDES

- A. Construction: Provide material, labor, equipment, services, tests and inspections necessary for the curing of concrete.

1.3 REFERENCE DOCUMENTS

- A. Standards: Comply with the provisions of the documents listed below and with the requirements described in this Section. Use current editions of documents unless earlier editions are specifically referenced by the governing code or are otherwise indicated.
 - 1. CBC – 2007 California Building Code.
 - 2. ACI - American Concrete Institute, Manual of Concrete Practice, including, but not limited to, the following sections:
 - a. ACI 301 "Specification for Structural Concrete for Buildings".
 - b. ACI 302.1R "Guide for Concrete Floor and Slab Construction".
 - c. ACI 305 "Hot Weather Concreting".
 - d. ACI 308 "Standard Practice for Curing Concrete".
 - e. ACI 506R "Guide to Shotcrete".
 - f. ACI 506.2 "Specification for Materials, Proportioning, and Application of Shotcrete."
 - 3. ASTM, American Society for Testing and Materials, designations referenced herein.

1.4 SUBMITTALS

- A. General: Submittals shall be sent to the Architect, or District's Testing Agency, or both, as required herein for review prior to commencing the work. Review of submittals covers the general character of the details and to verify compliance with the performance requirements. Review does not cover checking of quantities, proportions or dimensions. Such review shall not relieve the Contractor from responsibility for executing the work in accordance with the Contract Documents.
- B. Product Data: The Contractor shall submit manufacturer's data to the Architect for review.
- C. Sample panels: Refer to specification titled "Cast-in-Place Concrete" for sample panel submittal requirements.
- D. Mock-up: Refer to specification titled "Cast-in-Place Concrete" for mock-up submittal requirements.

1.5 TESTS AND INSPECTIONS

- A. Notification:
 - 1. The Contractor shall notify the District's Testing Agency of work to be tested and inspected. Notification shall be sufficiently in advance to allow scheduling of tests and inspections, but not less than 24 hours.
 - 2. The Contractor shall immediately notify the Architect if the District's Testing Agency indicates that quality assurance tests and inspection requirements have not been met.
- B. District's Quality Assurance Tests and Inspections:
 - 1. General: Quality assurance tests and inspections shall be the responsibility of the District. The District shall retain a testing agency, referred to herein as the District's Testing Agency, who shall perform the required tests and inspections, prepare written summary reports of tests and inspections, and review submittals.
 - 2. Curing inspection: Observe curing operations of all concrete to verify that products and procedures described herein have been followed, and that curing has been applied for the specified durations.

PART 2 - PRODUCTS

2.1 MOISTURE-RETAINING COVERS

- A. Reinforced Curing Paper: Waterproof paper conforming to ASTM C 171, non-staining. Acceptable products include "Orange Label Sisalkraft" by Fortifiber Building Systems Group, or equal.
- B. Curing Fabric: Plastic-backed burlap conforming to ASTM C 171. Acceptable products include "Curlap", or approved equal.

CONCRETE CURING

2.2 CURING COMPOUNDS

- A. Curing Compounds: ASTM C 309, Type 1-D or 2, Class B, or ASTM C 1315, Type 1, Class A. Curing compound shall not discolor concrete or affect bonding of other finishes applied there over.

PART 3 - EXECUTION

3.1 PROTECTION OF MATERIALS

- A. Protect materials from damage, weather, and contaminants such as grease, oil, and dirt.

3.2 CURING METHODS

- A. Moist Curing: Continuous misting, sprinkling, or ponding. Intermittent wetting is not acceptable.
- B. Moisture-Retaining Cover Curing: Thoroughly wet the surface of the concrete and then cover with moisture-retaining cover, placed in widest practical width, with edges lapped at least 12 inches and extended 18 inches beyond area of concrete to be cured, and sealed with waterproof tape. Maintain a film of water under the cover through the curing period by rolling back and rewetting. Immediately repair and holes or tears that occur using cover material and waterproof tape.
- C. Compound Curing: Uniformly apply two coats of compound in a continuous operation with second coat at right angles to first. The total coverage for two coats shall be 200 square feet maximum per gallon of undiluted compound unless otherwise recommended by the manufacturer's written instructions. The compound shall form a uniform, continuous film that will not crack or peel. Immediately apply an additional coat of compound to areas where film is defective. Recoat concrete surfaces subjected to rainfall within 3 hours after the curing compound application. Maintain compound on the concrete surface throughout the curing period and immediately repair any damage.

3.3 CAST-IN-PLACE CONCRETE CURING

- A. General: Do not permit concrete to become dry during curing period. Conform to the recommendations of ACI 308 and the following.
- B. Unformed Surfaces: Start curing operations as soon as free water has disappeared from concrete surface following finishing. Curing shall be maintained for 7 days.
 - 1. Curing Method Limitations: Accomplish curing by moist curing, moisture-retaining cover curing or compound curing subject to the following limitations.
 - a. Compound curing is not permitted for surfaces to receive glue-adhered floor coverings including carpet and resilient flooring.
 - b. Compound curing is not permitted for surfaces to receive bonded concrete, mortar, or plaster.
 - c. Compound curing is not permitted for surfaces to receive coatings or penetrants, including but not limited to: sealers, epoxy, paint, and fluid applied waterproofing.

- d. Compound curing is the only acceptable method for floors that remain exposed in completed construction.
- C. Formed Surfaces: Concrete in forms shall be kept continuously wet until the forms are removed, as specified in the specification section titled Concrete Forming. If forms are removed before 7 days the concrete shall immediately be cured until the end of 7 days by one of the methods specified herein.
- 1. Curing Method Limitations: Accomplish curing by moist curing, moisture-retaining cover curing or compound curing subject to the following limitations.
 - a. Compound curing is not permitted for surfaces to receive bonded concrete, mortar, or plaster.
 - b. Compound curing is not permitted for surfaces to receive coatings or penetrants, including but not limited to: sealers, epoxy, paint, and fluid applied waterproofing.

3.4 COLD WEATHER REQUIREMENTS

- A. When concrete will be subjected to freezing temperatures within 24 hours after placement, or when the concrete will be subjected to a period of 3 or more successive days within 7 days after placement where the average daily outdoor temperature drops below 40 degrees F, the concrete shall be protected from freezing. After placing concrete, maintain air temperature adjacent to the concrete at 50 degrees F minimum for 7 days, or 70 degrees F for a period of 3 days after placing and 40 degrees F minimum for the remaining 4 days.

3.5 HOT WEATHER REQUIREMENTS

- A. When hot weather conditions will cause an evaporation rate exceeding 0.2 pounds of water per square foot per hour, as determined by Figure 2.1.5 of ACI 305, cure for initial 24 hours by moist cure or moisture-retaining cover methods.

3.6 CORRECTION OF DEFECTIVE WORK

- A. Correction of defective work shall be the responsibility of the Contractor.
- B. Work not in compliance with the requirements of the Contract Documents shall be considered defective, unless otherwise directed in writing by the Architect.
- C. Corrected work shall conform to the requirements of the Contract Documents.
- D. The Contractor shall prepare a submittal documenting the defective work and proposed corrections and submit to the Architect for review. The submittal shall include a description of the defective work, the location of defective work, and shall be accompanied by supporting sketches, photographs, or both. Additionally, the submittal shall include similar documentation of the Contractor's proposed corrections.
- E. Correction of defective work shall not commence until the Architect has reviewed and accepted the submittal.
- F. Correction of defective work shall be inspected by the District's Testing Agency.

CONCRETE CURING

3.7 CLEAN-UP

- A. Remove from the site all debris resulting from the work of this Section.

- END OF SECTION -

- SECTION 03 5300 -

CONCRETE FLOOR TOPPING

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 THIS SECTION INCLUDES THE FOLLOWING:

- 1. Emery-aggregate concrete floor topping.
- 2. Iron-aggregate concrete floor topping.

1.3 RELATED SECTIONS

- A. Section 03 3000 "Cast-in-Place Concrete" for concrete slab construction and finish and concrete topping slabs, underbeds, overlays and fills.
- B. Section 03 3570 "Water Vapor Emission Control System" for water based non-corrosive, low viscosity, high gloss, microbial resistant, moisture-alkaline resistant polymer system to suppress, control and mechanically restrict up to 10.0 lbs. of water emission and a pH level of 14 in concrete substrates, where flooring finishes are to be installed.
- C. Section 09 3013 "Ceramic Tile" for medium-set and thickset mortar beds for tile.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for concrete floor toppings.
- C. Field quality-control test reports.
- D. Minutes of preinstallation conference.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage, mixing with other components, and application.
- B. Store materials to comply with manufacturer's written instructions to prevent deterioration from moisture or other detrimental effects.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature and moisture content, ambient temperature and humidity, ventilation, and other conditions affecting concrete floor topping performance.
 - 1. Place concrete floor topping only when ambient temperature and temperature of base slabs are between 50 and 86 deg F.
- B. Close areas to traffic during topping application and, after application, for time period recommended in writing by manufacturer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
- B. Products: Subject to compliance with requirements, provide one of the following:
 - 1. Emery-Aggregate Concrete Floor Topping:
 - a. Anti-Hydro International, Inc.; A-H Emery A-1 Premix.
 - b. Dayton Superior Corporation; Emery Tuff Top.
 - c. Emery-Crete, Inc.; Emery-Crete.
 - d. L&M Construction Chemicals, Inc.; Emerytop 400.
 - e. Metalcrete Industries; Met-Top E.
 - f. Vexcon Chemicals, Inc.; Emery-Crete SH.
 - 2. Iron-Aggregate Concrete Floor Topping:
 - a. Anti-Hydro International, Inc.; A-H Irontop.
 - b. Burke by Edeco; Iron Topping.
 - c. Conspec Marketing & Manufacturing Co., Inc.; Conplate Floor Topping.
 - d. Euclid Chemical Company (The); Super Euco-Top.
 - e. MBT Protection and Repair, Div. of ChemRex; Mastertop Anvil-Top 300.
 - f. Metalcrete Industries; Metalcrete.

2.2 CONCRETE FLOOR TOPPINGS

- A. Emery-Aggregate Concrete Floor Topping: Factory-prepared and dry-packaged mixture of graded, crushed emery aggregate containing not less than 50 percent aluminum oxide, not less than 24 percent ferric oxide, and not more than 8 percent silica; portland cement or blended hydraulic cement; plasticizers; and other admixtures to which only water needs to be added at Project site.
 - 1. Compressive Strength (28 Days): 7000 psi; ASTM C 109/C 109M.
- B. Iron-Aggregate Concrete Floor Topping: Factory-prepared and dry-packaged mixture of graded iron aggregate, portland cement, plasticizers, and other admixtures to which only water needs to be added at Project site.
 - 1. Compressive Strength (28 Days): 10,000 psi; ASTM C 109/C 109M.

2.3 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Potable.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, 25 percent solids content, minimum.

2.4 RELATED MATERIALS

- A. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A Shore durometer hardness of 80 or aromatic polyurea with a Type A Shore durometer hardness range of 90 to 95 per ASTM D 2240.
- B. Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.
- C. Portland Cement: ASTM C 150, Type I or II.
- D. Sand: ASTM C 404, fine aggregate passing No. 16 sieve.
- E. Water: Potable.
- F. Acrylic-Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- G. Epoxy Adhesive: ASTM C 881, Type V, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class and grade to suit requirements.

2.5 MIXING

- A. Bonding Slurry: Mix 1 part portland cement and 1-1/2 parts sand with water and an acrylic-bonding agent according to manufacturer's written instructions to a thick paint consistency.
- B. Floor Topping: Mix concrete floor topping materials and water in appropriate drum-type batch machine mixer or truck mixer according to manufacturer's written instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for conditions affecting performance of concrete floor topping.
- B. Verify that base concrete slabs comply with scratch finish requirements specified in Division 3 Section "Cast-in-Place Concrete."
- C. Verify that base slabs are visibly dry and free of moisture. Test for capillary moisture by the plastic sheet method according to ASTM D 4263.
- D. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Existing Concrete: Remove existing surface treatments and deteriorated and unsound concrete. Mechanically abrade base slabs to produce a heavily scarified surface profile with an amplitude of 1/4 inch
 1. Prepare and clean existing base slabs according to concrete floor topping manufacturer's written instructions. Fill voids, cracks, and cavities in base slabs.
 2. Mechanically remove contaminants from existing concrete that might impair bond of floor topping.
 3. Saw cut contraction and construction joints in existing concrete to a depth of 1/2 inch and fill with semirigid joint filler.
 4. To both sides of joint edges and at perimeter of existing base slab mechanically remove a 4-inch- wide and 0- to 1-inch deep, tapered wedge of concrete and retexture surface and install concrete nails in manufacturer's recommended staggered pattern.
- B. Install joint-filler strips where topping abuts vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
 1. Extend joint-filler strips full width and depth of joint, terminating flush with topping surface, unless otherwise indicated.
 2. Terminate full-width, joint-filler strips 1/2 inch below topping surface where joint sealants, specified in Division 7 Section "Joint Sealants," are indicated.
 3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

3.3 FLOOR TOPPING APPLICATION

- A. Start floor topping application in presence of manufacturer's technical representative.
- B. Monolithic Floor Topping: After textured-float finish is applied to fresh concrete of base slabs specified in Division 3 Section "Cast-in-Place Concrete," place concrete floor topping while concrete is still plastic.
- C. Deferred Floor Topping: Within 72 hours of placing base slabs, mix and scrub bonding slurry into dampened concrete to a thickness of 1/16 to 1/8 inch, without puddling. Place floor topping while slurry is still tacky.
- D. Existing Concrete: Apply epoxy-bonding adhesive, mixed according to manufacturer's written instructions, and scrub into dry base slabs to a thickness of 1/16 to 1/8 inch, without puddling. Place floor topping while adhesive is still tacky.
- E. Place concrete floor topping continuously in a single layer, tamping and consolidating to achieve tight contact with bonding surface. Do not permit cold joints or seams to develop within pour strip.
 - 1. Screed surface with a straightedge and strike off to correct elevations.
 - 2. Slope surfaces uniformly where indicated.
 - 3. Begin initial floating using bull floats to form a uniform and open-textured surface plane free of humps or hollows.
- F. Finishing: Consolidate surface with power-driven floats as soon as concrete floor topping can support equipment and operator. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until concrete floor topping surface has a uniform, smooth, granular texture.
 - 1. Hard Trowel Finish: After floating surface, apply first trowel finish and consolidate concrete floor topping by power-driven trowel without allowing blisters to develop. Continue troweling passes and restraighten until surface is smooth and uniform in texture.
 - a. Finish surfaces to specified overall values of flatness, F(F) 25; and levelness, F(L) 20; with minimum local values of flatness, F(F) 17; and levelness, F(L) 15, and measure within 24 hours according to ASTM E 1155 for a randomly trafficked floor surface.
 - b. Finish and measure surface so gap at any point between surface and an unlevelled freestanding 10-foot- long straightedge, resting on 2 high spots and placed anywhere on the surface, does not exceed 1/4 inch.
- G. Construction Joints: Construct joints true to line with faces perpendicular to surface plane of concrete floor topping, at locations indicated or as approved by Architect.
 - 1. Coat face of construction joint with epoxy adhesive at locations where concrete floor topping is placed against hardened or partially hardened concrete floor topping.
- H. Contraction Joints: Form weakened-plane contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete floor topping when cutting action will not tear, abrade, or otherwise damage surface and before random contraction cracks develop.
 - 1. Form joints in concrete floor topping over contraction joints in base slabs, unless otherwise indicated.

2. Construct contraction joints for a combined depth equal to topping thickness and not less than one-fourth of base-slab thickness.
3. Construct contraction joints for a depth equal to one-half of concrete floor topping thickness, but not less than 1/2 inch deep.

3.4 PROTECTING AND CURING

- A. General: Protect freshly placed concrete floor topping from premature drying and excessive cold or hot temperatures.
- B. Evaporation Retarder: Apply evaporation retarder to concrete floor topping surfaces in hot, dry, or windy conditions before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying floor topping, but before float finishing.
- C. Begin curing immediately after finishing concrete floor topping. Cure by one or a combination of the following methods, according to concrete floor topping manufacturer's written instructions:
 1. Moisture Curing: Keep surfaces continuously moist for not less than 7 days with water, continuous water-fog spray or absorptive cover, water saturated and kept continuously wet. Cover topping surfaces and edges with 12-inch lap over adjacent absorptive covers.
 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 3. Curing Compound: Apply uniformly in two coats in continuous operations by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.5 JOINT FILLING

- A. Prepare and clean contraction joints and install semirigid joint filler, according to manufacturer's written instructions, once topping has fully cured.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.
- C. Install semirigid joint filler full depth of contraction joints. Overfill joint and trim semirigid joint filler flush with top of joint after hardening.

3.6 REPAIRS

- A. Defective Topping: Repair and patch defective concrete floor topping areas, including areas that have not bonded to concrete substrate.

3.7 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

CONCRETE FLOOR TOPPING

- B. Testing Services: Testing and inspecting of completed applications of concrete floor toppings shall take place in successive stages, in areas of extent and using methods as follows:
1. Sample Sets: At point of placement, a set of 3 molded-cube samples shall be taken from the topping mix for the first 1000 sq. ft., plus 1 set of samples for each subsequent 5000 sq. ft. of topping, or fraction thereof, but not less than 6 samples for each day's placement. Samples shall be tested according to ASTM C 109/C 109M for compliance with compressive-strength requirements.
 2. Concrete floor topping shall be tested for delamination by dragging a steel chain over the surface.
 3. Concrete floor topping shall be tested for compliance with surface flatness and levelness tolerances.
- C. Remove and replace applications of concrete floor topping where test results indicate that it does not comply with specified requirements.
- D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

- END OF SECTION -

- SECTION 03 5416 -

HYDRAULIC 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 hydraulic-cement-based, polymer-modified, self-leveling underlayment for application below interior floor coverings.
- B. Related Sections:
 - 1. Division 09 Sections for patching and leveling compounds applied with floor coverings.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. LEED Submittals:
 - 1. Product Data for Credit MR 4.1: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
 - a. Include statement indicating costs for each product having recycled content.
 - 2. Product Data for Credit EQ 4.1: For adhesives and sealants, documentation including printed statement of VOC content and chemical components.
- C. Shop Drawings: Include plans indicating substrates, locations, and average depths of underlayment based on survey of substrate conditions.
- D. Qualification Data: For qualified Installer.
- E. Product Certificates: Signed by manufacturers of underlayment and floor-covering systems certifying that products are compatible.
- F. Minutes of preinstallation conference.

1.4 QUALITY ASSURANCE

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

- B. Product Compatibility: Manufacturers of underlayment and floor-covering systems certify in writing that products are compatible.
- C. Preinstallation Conference: Conduct conference at Project site.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to comply with manufacturer's written instructions to prevent deterioration from moisture or other detrimental effects.

1.6 PROJECT 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 hydraulic-cement-based underlayments only when ambient temperature and temperature of substrates are between 50 and 80 deg F (10 and 27 deg C).

1.7 COORDINATION

- A. Coordinate application of underlayment with requirements of floor-covering products and adhesives, specified in Division 09 Sections, to ensure compatibility of products.

PART 2 - PRODUCTS

2.1 HYDRAULIC-CEMENT-BASED UNDERLAYMENTS

- A. Underlayment: Hydraulic-cement-based, polymer-modified, self-leveling product that can be applied in minimum uniform thickness of **1/4 inch (6 mm)** 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. Ardex; K-15 Self-Leveling Underlayment Concrete.
 - b. Bonsal American, an Oldcastle company; ProSpec Level Set 300.
 - c. Dayton Superior Corporation; Levelayer.
 - d. L&M Construction Chemicals, Inc.; Levelex.
 - 2. Cement Binder: ASTM C 150, portland cement, or hydraulic or blended hydraulic cement as defined by ASTM C 219.
 - 3. Compressive Strength: Not less than 4000 psi (27.6 MPa) at 28 days when tested according to ASTM C 109/C 109M.
- B. Aggregate: Well-graded, washed gravel, **1/8 to 1/4 inch (3 to 6 mm)**; or coarse sand as recommended by underlayment manufacturer.
 - 1. Provide aggregate when recommended in writing by underlayment manufacturer for underlayment thickness required.
- C. Water: Potable and at a temperature of not more than **70 deg F (21 deg C)**.

HYDRAULIC CEMENT UNDERLAYMENT

- D. Primer: Product of underlayment manufacturer recommended in writing for substrate, conditions, and application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for conditions affecting performance.
 - 1. 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.
 - 1. Moisture Testing: Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates do not exceed a maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/100 sq. m) in 24 hours.
- C. 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 underlayment-to-substrate and intercoat adhesion.
 - 3. At substrate expansion, isolation, and other moving joints, allow joint of same width to continue through underlayment.
- B. Apply primer over prepared substrate at manufacturer's recommended spreading rate.
- C. Apply underlayment to produce uniform, level surface.
 - 1. Apply a final layer without aggregate to product surface.
 - 2. 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. Remove and replace underlayment areas that evidence lack of bond with substrate, including areas that emit a "hollow" sound when tapped.

3.4 PROTECTION

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

- END OF SECTION -

DIVISION 05 – METALS

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- SECTION 05 1200 -

STRUCTURAL STEEL

PART 1 - GENERAL

1.1 RELATED INFORMATION AND REQUIREMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, specific Specification Sections listed below, and all other Specification Sections apply to this Section.
 - 1. Cast-in-Place Concrete
 - 2. Metal Decking

1.2 SECTION INCLUDES

- A. Construction: Provide material, labor, equipment, services, tests and inspections necessary for the installation of structural steel including bracing and shoring required for erection and related work. The work also includes the following:
 - 1. Verification of anchor bolt setting and levels to assure adequate fit of the steel work.
 - 2. Temporary and permanent identification of SLRS protected zones.
 - 3. Deformed bar anchors and steel reinforcing welded to structural steel.
 - 4. Grouting of column bases.

1.3 RELATED SECTIONS

- A. Section 01 74 19 "Materials Recycling & Waste Management".
- B. Section 01 81 13 "LEED Certification Requirements".

1.4 REFERENCE DOCUMENTS

- A. Standards: Comply with the provisions of the documents listed below and with the requirements described in this Section. Use current editions of documents unless earlier editions are specifically referenced by the governing code or are otherwise indicated.
 - 1. CBC – 2007 California Building Code.
 - 2. AISC - American Institute of Steel Construction:
 - a. AISC 303 - Code of Standard Practice for Steel Buildings and Bridges, except as follows:
 - 1) Horizontal and vertical dimensions may not be shown entirely on the Structural Drawings.

- 2) Division 1 requirements and those specified herein shall govern in case of conflict.
- b. ANSI/AISC 341 - Seismic Provisions for Structural Steel Buildings, Including Supplement No. 1.
- c. ANSI/AISC 358 - Prequalified Connections for Special and Intermediate Steel Moment Frames for Seismic Applications.
- d. ANSI/AISC 360 - Specification for Structural Steel Buildings.
- e. AISC - Steel Construction Manual
3. RCSC – Research Council on Structural Connections “Specification for Structural Joints Using ASTM A 325 or A 490 Bolts.”
4. AWS - American Welding Society’s
 - a. AWS D1.1 - Structural Welding Code - Steel.
 - b. AWS D1.8 - Structural Welding Code - Seismic Supplement.
5. SSPC - Steel Structures Painting Council, designations referenced herein.
6. ICC Evaluation Service - Provide “Evaluation Report” for product where specified herein.
7. ASTM, American Society for Testing and Materials, designations referenced herein.

1.5 DEFINITIONS

- A. Structural Steel: As defined in Section 2 of AISC 303.
- B. Seismic Load Resisting System (SLRS): Members and connections designated on the Drawings to resist seismic forces, including:
 1. Collectors and chords: Framing members designated on the Drawings to receive collector connections at one or both ends.
 2. Other members and connections designated as SLRS on the Drawings.
- C. Demand Critical Welds (DCW): Welds designated as DCW on the Drawings that are anticipated to be in areas of moderate to high inelastic strain demand or have a significant consequence if failure occurs.
- D. Protected Zone: Areas of members and connections of the SLRS designated on the Drawings where discontinuities created by fabrication and erection operations, installation of welded shear studs, decking attachments that penetrate beam flanges and other structural and non-structural welded, bolted, screwed and shot-in attachments are restricted per ANSI/AISC 341, Section 7.4.

1.6 SUBMITTALS

- A. General: Submittals shall be sent to the Architect, or District’s Testing Agency, or both, as required herein for review prior to commencing the work. Review of submittals covers the general character of the details and to verify compliance with the performance requirements. Review does not cover checking of quantities, proportions or dimensions. Such review shall not relieve the Contractor from responsibility for executing the work in accordance with the Contract Documents.
- B. Mill Analysis Reports: Contractor shall submit certified copies of mill analysis reports covering the chemical and physical properties of the structural steel to the District’s Testing Agency for review.

STRUCTURAL STEEL

- C. LEED Submittal: See Section 018113 LEED Certification Requirements for the following:
1. MRc4 Recycled Content: Product data for products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content.
 - a. Include cost information for each product having recycled content.
 2. MRc5 Regional Materials:
 - a. Sourcing location(s): indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery from the project site.
 - b. Manufacturing location(s): indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
 - c. Product Value: indicate dollar value of product containing regional materials; include materials costs only.
 - d. Product Component(s) Value: Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.
- D. Certificates of Conformance: Contractor shall submit to the District's Testing Agency for review manufacturer's certificates of conformance for the following materials:
1. Bolts, nuts, washers
 2. Welding electrodes, fluxes, shielding gases
 3. Welded studs.
- E. Filler Metal Toughness: For SLRS and demand critical welds, submit manufacturer's certificates of conformance to the Architect and the District's Testing Agency confirming that the filler metals meet the Charpy V-Notch toughness requirements of Part 2 of this specification.
- F. Shop and Erection Drawings: Contractor shall submit shop drawings to the Architect for review. Shop drawings shall include, but not be limited to, anchor bolt sizes and layout, member sizes and materials, details of members, connections, weld sizes and profiles, sizes and spacing of bolts, surface preparations and finishes, and corresponding erection plans showing the marking, position and orientation of each member and connection. Detail drawings shall indicate the marking of each member as shown on the erection plans. Shop and erection details incorporating SLRS and demand critical welds shall include explicit references to corresponding weld procedure specifications.
1. Complete horizontal and vertical control information may not be shown on the Structural Drawings and the Contractor shall obtain such information from the documents of other disciplines in order to provide a complete submittal. Prior to the preparation of detailed fabrication drawings, the Contractor shall prepare, submit, and obtain approval of coordinated erection drawings complete with horizontal and vertical dimensions.
- G. Welding Procedure Specifications: Contractor shall submit welding procedure specifications (WPS) for each shop and field welding joint type and process to the Architect and the District's Testing Agency for review.
1. The WPS shall be prepared and signed by a welding professional whose qualifications include a minimum of 5 years experience with the welding technologies proposed.
 2. The WPS shall include, at a minimum, the information specified in AWS D1.1, Section 3 and the supplemental provisions of Annex H.

3. Prequalified WPS may be used provided they meet the requirements of AWS D1.1, Section 3 for prequalified welds.
 4. Any single deviation from the AWS D1.1 requirements for prequalified welds shall necessitate qualification by test per AWS D1.1, Section 4. WPS that are qualified by testing shall conform the additional requirements of AWS D1.1, Annex IV and shall include the corresponding Procedure Qualification Records (PQRs).
 5. WPS for SLRS and for demand critical welds shall conform to the additional requirements of AWS D1.8, Section 6.1.
 6. SLRS and demand critical welds shall be indicated on the applicable WPS. Alternately they may be identified in the table of contents of the WPS submittal.
- H. Welder Performance Qualification Records (WPQR): Contractor shall submit WPQR for each shop and field welder to the District's Testing Agency for review.
- I. Distortion Control Program: The contractor shall prepare and submit a written distortion control program that specifies welding sequence requirements for SLRS joints, including intended sequence for flange and web welding and bolting.
- J. Manufacturer Data: Submit manufacturer data and ICC report for deformed bar anchors.
- K. Contractor's quality control test reports: The Contractor shall submit quality control test reports to the Architect and District's Testing Agency for review.

1.7 TESTS AND INSPECTIONS

- A. Notification:
1. The Contractor shall notify the District's Testing Agency of work to be tested and inspected. Notification shall be sufficiently in advance to allow scheduling of tests and inspections, but not less than 24 hours.
 2. The Contractor shall immediately notify the Architect if the District's Testing Agency indicates that quality assurance tests and inspection requirements have not been met.
- B. District's Quality Assurance Tests and Inspections:
1. General: Quality assurance tests and inspections shall be the responsibility of the District. The District shall retain a testing agency, referred to herein as the District's Testing Agency, who shall perform the required tests and inspections, prepare written summary reports of tests and inspections, and review submittals.
 2. The District's Testing Agency shall submit written procedures, qualifications and reports as specified in ANSI/AISC 341, Appendix Q, Section Q4.
 3. The District's Testing Agency shall perform tests and inspections per CBC, Chapter 17A and as follows:
 - a. Collect and review certified mill analysis reports.
 - b. Review steel identification per CBC Section 2203A.2. Material that cannot be identified or has a questionable source shall be tested by the Contractor's Testing Agency.
 - c. Collect and review certificates of conformance. Materials not accompanied by manufacturer certificates shall be tested by the Contractor's Testing Agency.

- d. Welding Tests and Inspections:
- 1) Personnel performing welding inspections and nondestructive testing shall meet the minimum qualifications specified in AWS D1.1, Section 6.
 - 2) Personnel performing welding inspections and nondestructive testing on SLRS and demand critical welds shall meet the additional qualifications specified in AWS D1.8, Section 7.
 - 3) Review shop and field WPS in accordance with AWS D1.1 and D1.8.
 - 4) Confirm welders, welding foreman, and QC Inspectors have a copy of the approved WPS.
 - 5) Review WPQR in accordance with AWS D1.1 and D1.8 for the welds to be performed.
 - 6) Confirm welding equipment settings, and voltage and amperage at point of welding.
 - 7) Perform visual inspection of shop and field welds in accordance with ANSI/AISC 341, Appendix Q, Section Q5.1. Inspections for items marked P (Perform) for both QC and QA inspections shall be the performed by the District's Testing Agency. Acceptance criteria for visually inspected welds shall be in accordance with AWS D1.1, Section 6.
 - 8) Perform nondestructive tests (NDT) of shop and field welds in accordance with ANSI/AISC 341, Appendix Q, Section Q5.2, except as noted below. Provide NDT equipment as required to perform specified tests.
 - a) Ultrasonic testing (UT) shall conform to AWS D1.8, Section 7.10.
 - b) The rate of ultrasonic testing on complete joint penetration (CJP) groove welds may be reduced to 25-percent for an individual welder or welding operator after sufficient project experience is demonstrated per Appendix Q, subsection Q5.2g. However, no reduction in testing frequency shall be permitted for demand critical welds.
 - c) Magnetic Particle (MP) testing shall conform to AWS D1.8, Section 7.9.
 - d) The rate of magnetic particle testing on CJP groove welds may be reduced to 10-percent for an individual welder or welding operator after sufficient project experience is demonstrated per Appendix Q, subsection Q5.2h. However, no reduction in testing frequency shall be permitted for demand critical welds.
- e. High-Strength Bolting Tests and Inspections:
- 1) Sample and test high strength bolts, nuts and washers in accordance with the requirements of the Specification for Structural Joints Using ASTM A 325 or A 490 Bolts.
 - 2) Inspect installation of high strength bolts per ANSI/AISC 341, Appendix Q, Section Q5.3. Inspections for items marked P (Perform) for both QC and QA inspections shall be the performed by the District's Testing Agency.
- f. Welded and bolted connections that fail to meet the acceptance criteria specified shall be re-inspected and/or re-tested after corrections have been made by the Contractor.
- g. Welded Studs: Inspect size, number, placement and welding of welded studs in accordance with Section 7 of AWS D1.1.

- h. Deformed Bar Anchors: Inspect size, number, placement and welding of deformed bar anchors in accordance with the manufacturer's ICC report.
 - i. Confirm structural and non-structural connections do not occur in the protected zones of the SLRS, except as indicated on the Drawings.
 - j. The District's Testing Agency shall review Contractor quality control test and inspection reports.
 - k. Take one set of three 2-inch mortar cubes for compressive strength tests per ASTM C 109 each day grout is placed. Test one cube 7 days after molding and two cubes at 28 days after molding.
- C. Contractor's Quality Control Tests and Inspections:
- 1. General: Quality control tests and inspections shall be the responsibility of the Contractor. Where required herein, the Contractor shall retain a testing agency, referred to herein as the Contractor's Testing Agency, to demonstrate that quality control conforms to the requirements of the Contract Documents. Quality Control Test and Inspection Reports shall be prepared and submitted for review.
 - 2. Welding Quality Control Inspections: The Contractor's Testing Agency shall perform visual inspection of welding per ANSI/AISC 341, Appendix Q, Section Q5.1.
 - a. Personnel performing quality control inspections of welding shall meet the minimum qualifications specified in AWS D1.8, Section 7.
 - b. The Contractor's Testing Agency need not perform inspections for items marked P (Perform) for both QC and QA inspections. These inspections will be performed by the District's Testing Agency.
 - 3. High-Strength Bolting Quality Control Inspections: The Contractor's Testing Agency shall perform visual inspection of high-strength bolting per ANSI/AISC 341, Appendix Q, Section Q5.3.
 - a. The Contractor's Testing Agency need not perform inspections for items marked P (Perform) for both QC and QA inspections. These inspections will be performed by the District's Testing Agency.
 - 4. Tension Tests: The Contractor's Testing Agency shall conduct one tension test and one bend test in accordance with ASTM A 370 for each heat of structural steel not accompanied by certified mill analysis reports. Test reports shall be reviewed by the District's Testing Agency before placement of steel.
 - 5. Filler Metal Toughness Tests: The Contractor's Testing Agency shall test each type of filler metal not accompanied by the manufacturer's certificate of conformance for the filler metal toughness requirements in Part 2 of this specification. Test procedures shall conform to ANSI/AISC 341, Appendix X.
- D. Pre-Construction Conference: The contractor shall arrange and sponsor one preconstruction conference, following approval of project WPSs and prior to start of shop and field welding operations. At a minimum, the Contractor, Contractor's Welding Quality Control Inspector, the Contractor's Welding Foreman, the District's Testing Agency and the Engineer of Record shall attend. Attendees shall review the approved Welding Procedure Specifications (WPS) and other special welding requirements for the project. A sample agenda is included at the end of this section.

PART 2 - PRODUCTS

2.1 STRUCTURAL STEEL MATERIALS

- A. Wide Flange Shapes: ASTM A 992.
 - 1. Heavy Sections: Heavy sections shall meet the requirements of ANSI/AISC 360, Section A3.1c. Hot rolled shapes in the SLRS with flange thicknesses 1-1/2 inch and thicker shall also have a minimum Charpy V-Notch toughness of 20 ft-lb at 70 degrees F tested in the alternate core location as described in ASTM A6, Supplementary Requirement S30.
- B. Plates and Bars: ASTM A 36, typical. Provide ASTM A572, Grade 50, for SLRS, unless otherwise noted on the Drawings.
 - 1. Heavy Sections: Heavy sections shall meet the requirements of ANSI/AISC 360 Section A3.1d. Steel plates 2" and thicker used in the SLRS for cover plates and base plates shall also have a minimum Charpy V-notch toughness of 20 ft-lb at 70 degrees F tested at any location permitted by ASTM A673.
- C. Channel and Angles: ASTM A 36.
- D. Round and Rectangular Hollow Structural Sections: ASTM A 500, Grade B
- E. Pipe: ASTM A 53, Grade B

2.2 FASTENER PRODUCTS AND MATERIALS

- A. Anchor Rods: ASTM F1554, Grade 36 or ASTM A 36 with ASTM A 563, Grade A heavy hex nuts.
- B. High-Strength Anchor Rods: Provide ASTM F1554, Grade 105 high-strength anchor rods with ASTM A 563, Grade DH heavy hex nuts where noted on the Drawings.
- C. Machine Bolts: ASTM A 307, Grade A, hex headed bolts with ASTM A 563, Grade A, hex nut.
- D. High-Strength Bolts: ASTM A 325, Type 1, with ASTM A 563, Grade C or DH, heavy hex nuts and ASTM F 436 washers, typical. Provide connection type N typical and X or SC where noted on the Drawings.
 - 1. Twist-off type tension-control bolt assemblies conforming to the requirements of ASTM F 1852 shall be permitted at pretensioned bolt locations, except at slip critical bolted connections and where noted on the Drawings.
 - 2. Compressible-washer-type direct indicators conforming to the requirements of ASTM F 959, Type 325, shall be permitted at pretensioned bolt locations except where noted on the Drawings.
- E. Welded Studs: Type B headed shear studs per AWS D1.1, Section 7.
- F. Deformed Bar Anchors: ASTM A 496 deformed wire. Acceptable manufacturers include Nelson Stud Welding Inc., Stud Welding Associates or equal. Alternately, welded ASTM A 706 reinforcing bars may be used.

2.3 WELDING MATERIALS AND PRODUCTS

- A. Arc-Welding Filler Metals: Filler metals shall be low hydrogen types conforming to AWS D1.1, Table 3.1 and shall be as recommended by the manufacturer for the position, thickness and other conditions of use.
 - 1. Electrode Wire Diameter: Wire diameter shall not exceed the maximum values specified in AWS D1.1, Table 3.7.
 - 2. Filler Metal Toughness:
 - a. Filler metals for shop and field welded joints designated as SLRS on the Drawings shall have a minimum Charpy V-Notch (CVN) toughness of 20 ft-lb at 0 degrees Fahrenheit as determined by AWS A5 classification test method or manufacturer certification.
 - b. Filler metals for shop and field welded joints designated as demand critical welds on the Drawings shall have a minimum Charpy V-Notch (CVN) toughness of 20 ft-lb at -20 degrees Fahrenheit as determined by the appropriate AWS classification test method or manufacturer certification and 40 ft-lb at 70 degrees Fahrenheit as determined by ANSI/AISC 341, Appendix X or other approved method.
- B. Arc-welding equipment: Welding equipment shall have calibrated meters for voltage and amperage that accurately indicate these values at the point of welding for the length of cable to be used. Contractor shall demonstrate to the satisfaction of the District's Testing Agency the accuracy of the meters, using external meters attached to extension cables of a length that reflects actual project conditions. If equipment meters do not accurately reflect the electrical properties at the point of welding, the Contractor shall provide external meters.

2.4 COATING PRODUCTS AND MATERIALS

- A. Structural Steel Primer Paint: Alkyd based primers shall be Tnemec, Series V10, red metal primer as manufactured by Tnemec Inc., Maclac, 42 Series, red oxide primer as manufactured by R.J. McGlennon Co. Inc., or equal. Volatile Organic Compounds (V.O.C.) shall not exceed 340 grams per liter as applied.
- B. Shop Galvanizing: Items noted on the Drawings or in the specifications as galvanized shall be hot-dip galvanized in accordance with ASTM A 123.
- C. Galvanizing Repair: Repair materials shall conform to ASTM A 780.

2.5 MISCELLANEOUS MATERIALS AND PRODUCTS

- A. Non-Shrink Grout: ASTM C 1107 premixed, non-shrink, non-staining grout. Acceptable products include Masterflow 928 grout as manufactured by BASF Construction Chemicals LLC, Edoco Non-Ferrous, Non-Shrink Grout as manufactured by Edoco Construction Chemicals, Five Star Grout as manufactured by Five Star Products Inc., or equal. Grout shall attain a minimum compressive strength of 7000-psi at 28-days.

PART 3 - EXECUTION

3.1 PROTECTION OF MATERIALS

- A. Protect materials from damage, weather, and contaminants such as grease, oil, and dirt.
- B. Provide temporary identification of SLRS protected zones prior to erection. Provide permanent identification as soon as practical after temporary identification is covered by fireproofing or paint or other finishes.

3.2 COORDINATION

- A. Coordinate locations and sizes of penetrations and openings in structural steel with the Drawings and the work of other trades. Verify conformance with the structural requirements shown on the Drawings.

3.3 FABRICATION

- A. General: Fabricate structural steel in accordance with AISC 303 and ANSI/AISC 360.
 - 1. Conform to the additional requirements of ANSI/AISC 341 for members and connections in the SLRS.
- B. Dimensions: Contractor shall obtain dimensions from the Structural Drawings, drawings of the other disciplines as necessary for the fabrication of the structural steel. Complete dimensions may not be shown on the Structural Drawings.
- C. Thermal Cutting: Thermal cutting shall be done by machine to the greatest extent possible. Plane thermally cut edges as necessary to comply with edge preparation requirements of AWS D1.1.
- D. Bearing Surfaces: Column bases, base plates and other bearing plates shall be milled to a true plane perpendicular to the axis of the member for complete bearing at the contact face.
 - 1. Bearing plates 2-inches or less in thickness are permitted without milling, provided a satisfactory contact bearing is obtained.
 - 2. Top surfaces of base plates where columns are connected by CJP groove welds need not be milled.
 - 3. Bottom surfaces of base plates to be grouted need not be milled.
- E. Camber: Provide camber for beams and girders as indicated on the Drawings.
- F. Anchor Rods Provide column anchor rods setting templates for installation under the section entitled "Cast-In-Place Concrete."
 - 1. Anchor rod holes in base plates shall conform to table 14-2 of AISC's "Steel Construction Manual" unless otherwise noted on the Drawings.
- G. Machine Bolts: Install machine bolts snug tight, unless otherwise noted on the Drawings.

- H. High-Strength Bolts (HSBs): Install high strength bolts in accordance with RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for the types of joints shown on the Drawings:
1. Holes for bolts shall be standard 1/16 inch larger than the nominal diameter of the bolt, unless otherwise noted on the Drawings.
 2. Holes may be punched or drilled in material with a thickness not greater than the nominal bolt diameter plus 1/8 inch. Holes in thicker material shall be drilled or sub-punched and reamed. Thermal cutting of holes is not permitted. Burrs shall be removed from holes by grinding.
 3. HSBs shall be fully tensioned unless otherwise noted on the Drawings.
 4. Faying Surfaces: Provide Class A surfaces for connections of structural steel using slip-critical bolts. Provide Class C surfaces for connections of hot-dip galvanized steel using slip-critical bolts.
- I. Welding: Welding shall conform to the requirements of ANSI/AISC 360 and AWS D1.1 using proven methods and techniques suitable for the connection configuration to be welded.
1. Use equipment that will supply the current and voltage at the point of welding shown on the approved WPS as recommended by the electrode manufacturer. Suitable meters and means of adjustment shall be provided for current and voltage.
 2. Weld in accordance with the approved WPS.
 3. Welders, welding foremen and the Contractor's QC Inspector shall have a copy of and be capable of reading the approved WPS. Welders shall be qualified by tests per AWS D1.1 to perform the types of welds required.
 4. Filler metals shall conform to AWS D1.1, Table 3.1.
 5. Groove welds shall be complete joint penetration welds unless noted otherwise on the Drawings. Joint preparation and fit-up shall be in accordance with the approved WPS.
 6. Partial penetration groove welds shall have a root face of 1/8-inch unless otherwise noted on the Drawings. Joint preparation and fit-up shall be in accordance with the approved WPS.
 7. Welded connections in the SLRS shall comply with the additional requirements of AWS D1.8, including the supplemental requirements for demand critical welds, and as follows:
 - a. Filler metals shall conform to the filler metal toughness requirements specified in Part 2 of this specification.
 - b. Weld Access Holes: Weld access holes for CJP groove welds of beams to columns shall conform to ANSI/AISC 360, Section J1.6, unless otherwise noted on the Drawings.
 - c. Welders shall pass the "Supplemental Welder Qualification for Restricted Access Welding" as specified in AWS D1.8, Section 5.1 where welding beam flanges to columns through web and gusset plate access holes at demand critical weld locations.
 - d. End dams shall not be permitted, except at the outboard edge of weld tabs that are to be removed after completion of the weld.
 - e. Backing bars shall be removed where noted on the Drawings.
 - f. Provide reinforcing fillets where noted on the Drawings. Geometry shall be in accordance with AWS D1.8, Figure 6.1.

- J. Fabrication Tolerances: Fabrication tolerances shall conform to AISC 303, unless otherwise noted.
- K. Welded Studs: Install welded studs in accordance with Section 7, Stud Welding, of AWS D1.1.
- L. Deformed Bar Anchors: Install deformed bar anchors in accordance with the ICC report. See section entitled "Concrete Reinforcement" for welding requirements where ASTM A 706 is used.

3.4 FINISHES

- A. Surface Preparation:
 - 1. Remove visible oil, grease, soil, drawing and cutting compounds, and other soluble contaminants from all steel surfaces in accordance with SSPC-SP1 "Solvent Cleaning."
 - 2. After fabrication, remove loose mill scale, rust, paint, and other detrimental foreign matter in accordance with SSPC-SP2 "Hand Tool Cleaning" for the following steel surfaces:
 - a. Steel to receive sprayed-on fireproofing.
 - b. Steel to be embedded or encased in concrete.
 - c. Steel to be hot-dip galvanized.
 - 3. After fabrication, remove loose mill scale, rust, paint, and other detrimental foreign matter from steel surfaces to be primed in accordance with SSPC-SP3 "Power Tool Cleaning."
- B. Shop Prime Painting:
 - 1. Shop prime structural steel, except as follows:
 - a. Members or portions of members to be fireproofed
 - b. Members or portions of members to be embedded in concrete or mortar, except for the initial 2-inches.
 - c. Faying surfaces of connections using slip critical bolts.
 - d. Surfaces to be field welded, including flange surfaces to receive metal decking.
 - e. Surfaces to be hot-dip galvanized.
 - f. Surfaces that will not be exposed to view.
 - 2. Immediately after surface preparation, apply structural steel primer paint in accordance with the manufacturer's instructions at a rate to provide a uniform dry film thickness of 3.0 mils. Use painting methods that will result in full coverage of joints, corners, edges and exposed surfaces.
 - a. Apply two coats of primer to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from the first.
- C. Hot-Dip Galvanizing:
 - 1. Hot-dip galvanize exterior exposed steel and other members shown on the Drawings in accordance with ASTM A 123.
 - 2. Hot-dip galvanize exterior steel bolts, nuts and washers, and other hardware shown on the Drawings in accordance with ASTM A 153.
 - 3. After hot-dip galvanizing, roughen faying surfaces of slip critical connections by hand wire brushing to achieve Class C surface per RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts." Power wire brushing is not permitted.

3.5 ERECTION

- A. General: Erect structural steel in accordance with AISC 303 and ANSI/AISC 360.
 - 1. Conform to the additional requirements of ANSI/AISC 341 for members and connections in the SLRS.
- B. Where erection requires fabrication on site, conform to the requirements of section 3.3 "Fabrication" of this Specification.
- C. Machine Bolts: Install machine bolts snug tight, unless noted otherwise on the Drawings.
- D. High-Strength Bolts: See section 3.3 "Fabrication" of this Specification.
- E. Welding: See section 3.3 "Fabrication" of this Specification.
- F. Column Base Plates: Column base plates shall be set level and to the correct elevation. Provide temporary supports until the columns have been plumbed and the base plates are grouted. The entire bearing area under base plates shall be grouted solid with non-shrink grout in accordance with the manufacturer's written instructions. Anchor bolts shall be installed snug tight, unless otherwise noted on the Drawings.
- G. Structural steel shall be erected true and plumb. Temporary shoring and bracing shall be provided wherever necessary and shall be adequate for the loads to which the structure may be subjected, including wind forces, erection equipment and operation of same. Temporary shoring and bracing shall remain in place as long as required for safety and until the final framing construction is complete. Final connections shall not be made until the structure has been properly aligned.
- H. Provide temporary flooring, planking and scaffolding as necessary for the erection of the structural steel and support of erection equipment. Temporary elements shall conform to applicable Federal, State and Local regulations.
- I. Erection Tolerances: Erection tolerances shall conform to AISC 303, unless otherwise noted.

3.6 FIELD TOUCH-UP PAINTING

- A. After erection, touch-up field welded connections and areas where shop primer has been disturbed. Surface preparation and painting shall be as specified for shop prime painting.
- B. Touch-up galvanized surfaces in accordance with ASTM A 780.

3.7 CORRECTION OF DEFECTIVE WORK

- A. Correction of defective work shall be the responsibility of the Contractor.
- B. Work not in compliance with the requirements of the Contract Documents shall be considered defective, unless otherwise directed in writing by the Architect.
- C. Corrected work shall conform to the requirements of the Contract Documents.

- D. The Contractor shall prepare a submittal documenting the defective work and proposed corrections and submit to the Architect for review. The submittal shall include a description of the defective work, the location of defective work, and shall be accompanied by supporting sketches, photographs, or both. Additionally, the submittal shall include similar documentation of the Contractor's proposed corrections.
- E. Correction of defective work shall not commence until the Architect has reviewed and accepted the submittal.
- F. Correction of defective work shall be inspected by the District's Testing Agency.

3.8 CLEAN-UP

- A. Remove from the site all debris resulting from the work of this Section.

SAMPLE AGENDA FOR A
PRE-CONSTRUCTION CONFERENCE
FOR
WELDING AND WELDING INSPECTION

QUALITY CONTROL

CONTRACTOR'S QUALITY CONTROL PROGRAM
DISTRICT'S TESTING AGENCY QUALITY ASSURANCE REQUIREMENTS
COMMUNICATION BETWEEN CONTRACTOR AND TESTING AGENCY
COMMUNICATION WITH THE ENGINEER

MATERIAL SPECIFICATIONS

STRUCTURAL STEEL SHAPES AND PLATES
BOLTS
WELD FILLER METALS
AESS REQUIREMENTS
PAINT/COATINGS
SPECIAL REQUIREMENTS
QUALITY ASSURANCE

SUBMITTALS

MILL CERTIFICATES
WELD PROCEDURE SPECIFICATIONS
DISTORTION CONTROL PROGRAM

GENERAL WELDING REQUIREMENTS

WELDER QUALIFICATION
POSSESSION OF THE WPS
USE OF THE APPROVED WPS
ENFORCEMENT OF THE WPS
WELDING EQUIPMENT CALIBRATION AND METERS
WELDING TECHNIQUE
VISUAL INSPECTION CHECKLIST
NDT INSPECTION CHECKLIST

SPECIAL "SLRS" AND "DEMAND CRITICAL WELD" REQUIREMENTS

FILLER METALS
PREHEAT
POSTHEAT
TECHNIQUE
ACCESSORIES
PROTECTED ZONES

- END OF SECTION -

STRUCTURAL STEEL

- SECTION 05 3100 -

STEEL DECKING

PART 1 - GENERAL

1.1 RELATED INFORMATION AND REQUIREMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, specific Specification Sections listed below, and all other Specification Sections apply to this Section.
 - 1. Cast-In-Place Concrete.
 - 2. Structural Steel.

1.2 SECTION INCLUDES

- A. Construction: Provide material, labor, equipment, services, tests and inspections necessary for the installation of composite and non-composite floor and roof steel decking, accessories and welded studs.

1.3 RELATED SECTIONS

- A. Section 01 74 19 "Materials Recycling & Waste Management".
- B. Section 01 81 13 "LEED Certification Requirements".

1.4 REFERENCE DOCUMENTS

- A. Standards: Comply with the provisions of the documents listed below and with the requirements described in this Section. Use current editions of documents unless earlier editions are specifically referenced by the governing code or are otherwise indicated.
 - 1. CBC – 2007 California Building Code.
 - 2. AISI - American Iron and Steel Institute, "Specification for the Design of Cold-Formed Steel Structural Members."
 - 3. AWS - American Welding Society
 - a. AWS D1.1 Structural Welding Code - Steel
 - b. AWS D1.3 Structural Welding Code – Sheet Steel
 - 4. SDI – Steel Deck Institute
 - a. Publication No. 31 – Design Manual for Composite Decks, Form Decks and Roof Decks.
 - 5. SSPC - Steel Structures Painting Council, designations referenced herein.
 - 6. ICC Evaluation Service - Provide "Evaluation Report" for product where specified herein.

7. ASTM, American Society for Testing and Materials, designations referenced herein.

1.5 SUBMITTALS

- A. General: Submittals shall be sent to the Architect, or District's Testing Agency, or both, as required herein for review prior to commencing the work. Review of submittals covers the general character of the details and to verify compliance with the performance requirements. Review does not cover checking of quantities, proportions or dimensions. Such review shall not relieve the Contractor from responsibility for executing the work in accordance with the Contract Documents.
- B. Shop Drawings: The Contractor shall submit shop drawings for review by the Architect showing the layout, fabrication and installation details, locations and dimensions of openings, opening reinforcing, and sizes and locations of welds and welded studs. Fabrication or delivery of material to the building site shall not begin until the Architect's review is complete.
- C. LEED Submittal: See Section 018113 LEED Certification Requirements for the following:
1. MRc4 Recycled Content: Product data for products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content.
 - a. Include cost information for each product having recycled content.
 2. MRc5 Regional Materials:
 - a. Sourcing location(s): indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery from the project site.
 - b. Manufacturing location(s): indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
 - c. Product Value: indicate dollar value of product containing regional materials; include materials costs only.
- D. Product Component(s) Value: Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.
- E. Manufacturer's Data: Submit current ICC report for steel decking, including allowable vertical load and diaphragm shear capacities.
- F. Certified Mill Analysis Reports: The Contractor shall submit certified mill analysis reports in accordance with ASTM designations referenced herein for each heat of steel decking, welded studs and welding electrodes to the District's Testing Agency for review.
- G. Welding Documents: The Contractor shall submit Welding Procedure Specifications (WPSs), Procedure Qualification Records (PQRs), and Welder Qualification Test Records (WQTRs) prepared in accordance with AWS D1.3 for each type of weld and position to be performed to the District's Testing Agency for review.
- H. Contractor's quality control test reports: The Contractor shall submit quality control test reports to the Architect and District's Testing Agency for review.

1.6 TESTS AND INSPECTIONS**A. Notification:**

1. The Contractor shall notify the District's Testing Agency of work to be tested and inspected. Notification shall be sufficiently in advance to allow scheduling of tests and inspections, but not less than 24 hours.
2. The Contractor shall immediately notify the Architect if the District's Testing Agency indicates that quality assurance tests and inspection requirements have not been met.

B. District's Quality Assurance Tests and Inspections:

1. General: Quality assurance tests and inspections shall be the responsibility of the District. The District shall retain a testing agency, referred to herein as the District's Testing Agency, who shall perform the required tests and inspections, prepare written summary reports of tests and inspections, and review submittals.
2. The District's Testing Agency shall perform tests and inspections in accordance with CBC Chapter 17, AWS D1.3, and AWS D1.1 where indicated:
 - a. Review WPSs, PQRs, WQTRs and suitability of welding equipment.
 - b. Inspect layout of steel deck and welding of deck to supports.
 - c. Inspect size, number, placement and welding of welded studs in accordance with Section 7 of AWS D1.1.
3. The District's Testing Agency shall review Contractor quality control test and inspection reports.

C. Contractor's Quality Control Tests and Inspections:

1. General:
 - a. Quality control tests and inspections shall be the responsibility of the Contractor.
 - b. Where required herein, the Contractor shall demonstrate that quality control conforms to the requirements of the Contract Documents.
 - c. Quality Control Test and Inspection Reports shall be prepared and submitted to the Architect and District's Testing Agency for review.
2. Tension tests of steel deck not accompanied by certified mill analysis reports: The Contractor shall conduct one tension test and one bend test in accordance with ASTM A 370 for each 5 tons or fraction thereof of each size or gage of steel deck not accompanied by certified mill analysis reports. Test reports shall be reviewed by the District's Testing Agency before placement of reinforcement.

PART 2 - PRODUCTS**2.1 MATERIALS****A. Decking, Closures and Edge Angles:**

1. Acceptable Manufacturers: Decking and accessories shall be as manufactured by ASC Profiles, Inc. (ESR-1414), Verco Manufacturers, Inc. (ESR-2078), or approved equal.
2. Materials: Form from steel conforming to ASTM A 653, SS, Grade 33, with a minimum yield strength of 38,000 psi. Before forming, the steel shall receive a protective zinc coating conforming to ASTM A 653, G60 minimum.

3. Vent Tabs: Steel deck supporting concrete fill shall have factory punched vent tabs, unless otherwise noted on the Drawings. Steel deck without concrete fill shall not be vented.
 4. Fire Resistance: Decks shall have been tested for fire resistance per ASTM E119 as part of an assembly of the type shown on the Drawings and shall be listed in the UL "Fire Resistance Directory."
- B. Miscellaneous Steel Shapes and Plates: ASTM A 36.
- C. Welded Studs: Type B headed shear studs per AWS D1.1, Section 7.
- D. Arc-Welding Electrodes: Conform to Table 5.1 of AWS D1.3 and Table 3.1 of AWS D1.1. Electrodes shall be as recommended by the manufacturer for the position or other conditions of use.
- E. Galvanizing Repair Paint: Zinc-Rich Primers conforming to SSPC-Paint 20.

PART 3 - EXECUTION

3.1 PROTECTION OF MATERIALS

- A. Protect materials from damage, weather, and contaminants such as grease, oil, and dirt.

3.2 COORDINATION

- A. Coordinate locations and sizes of penetrations and openings in steel decking with the Drawings and the work of other trades. Verify conformance with the structural requirements shown on the Drawings.

3.3 FABRICATION

- A. General Requirements: Properties of steel deck sections shall be computed in accordance with the AISI Specification. Decking units to receive concrete fill shall be designed with adequate provisions to transfer shear and to prevent vertical separation.
- B. Deck sizes, profiles, gages and minimum properties shall be as shown on the Drawings.
- C. Fabrication, cuts, etc., shall be done in the shop in accordance with SDI standards and the manufacturer's recommendations. All deck units shall be shipped to the field in standard widths and pre-cut lengths.
- D. Deck units shall be supplied in lengths to span over at least three supports where layout permits.
- E. Deck units shall abut over framing supports with minimum bearing as shown on the Drawings.
- F. Fabricate closure strips of galvanized sheet steel of the same quality as the deck units, not less than 18 gage thick before coating. Form to the configuration required to provide tight-fitting closures at open ends and sides of decking.

STEEL DECKING

- G. Provide 14-gage weld plates for shear transfer where the deck low flutes do not align with beams parallel to the deck. See Drawings for details.
- H. All deck units shall be provided with either an interlocking side laps or lapping type side laps.

3.4 INSTALLATION

- A. Steel decking shall be installed in the field by a steel deck contractor with a minimum of 5-years experience.
- B. Installation work shall be performed by workers skilled in their trade, in conformance with SDI standards and the manufacturer's recommendations.
- C. The steel deck units shall be placed on the supporting framework, aligned, and adjusted to final position before being permanently fastened. Each unit shall be brought to proper bearing on the supporting beams. If the supporting beams are not properly aligned or sufficiently level to permit proper bearing of steel units, notify the Architect before taking corrective action.
- D. Deck units shall be placed in straight alignment for the entire length of run with close registration of the cells of one unit with those of abutting and adjoining units. Provide minimum end lapping of lapped units or butting of abutting units as noted on the Drawings.
- E. Provide flashings and closures where required to prevent concrete leakage. Provide between decking and columns and at open ends of all cell runs at columns, walls, openings, etc., and those that occur where cells change direction. Closure pieces shall be cut same shape as deck profile as shown on the Drawings. Fasten in place by welding or sheet metal screws per manufacturer's printed directions, unless noted otherwise on the Drawings.
- F. Galvanizing Repair: Where galvanized surfaces are damaged, repair surfaces with zinc rich paint in accordance with procedures specified in ASTM A 780.

3.5 WELDING

- A. Make welds in accordance with Drawings. Use only welders certified for welding sheet steel per AWS D1.3. Button-punching or riv-clinching of deck will be permitted for vertical alignment only, unless otherwise noted on the Drawings. Crimp deck sections together at vertical side seams before welding.
- B. Welded studs shall be welded through steel deck to beam flanges in accordance with Section 7, Stud Welding, AWS D1.1.

3.6 REINFORCEMENT AT OPENINGS

- A. Provide reinforcement and closure pieces at openings as shown and detailed on the Drawings.
- B. Not all openings are shown on the Drawings. Openings not shown, such as openings required for ducts, stacks, conduits, plumbing, etc., shall be cut, closed, supported, and reinforced by the trade requiring the openings in accordance with the structural requirements shown on the Drawings.

3.7 CORRECTION OF DEFECTIVE WORK

- A. Correction of defective work shall be the responsibility of the Contractor.
- B. Work not in compliance with the requirements of the Contract Documents shall be considered defective, unless otherwise directed in writing by the Architect.
- C. Corrected work shall conform to the requirements of the Contract Documents.
- D. The Contractor shall prepare a submittal documenting the defective work and proposed corrections and submit to the Architect for review. The submittal shall include a description of the defective work, the location of defective work, and shall be accompanied by supporting sketches, photographs, or both. Additionally, the submittal shall include similar documentation of the Contractor's proposed corrections.
- E. Correction of defective work shall not commence until the Architect has reviewed and accepted the submittal.
- F. Correction of defective work shall be inspected by the District's Testing Agency.

3.8 CLEAN-UP

- A. Remove from the site all debris resulting from the work of this Section.

- END OF SECTION -

- SECTION 05 4000 -

COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Cold-formed metal framing for:
 - 1. Exterior non-load-bearing wall framing.

1.3 RELATED SECTIONS

- A. Section 01 74 19 "Materials Recycling & Waste Management".
- B. Section 01 81 13 "LEED Certification Requirements".
- C. Section 05 5000 "Metal Fabrication" for shelf angles and connections.
- D. Section 09 2216 "Non-Structural Metal Framing" for interior non-load-bearing, metal-stud framing and ceiling-suspension assemblies.

1.4 REFERENCES

- A. SSMA – Steel Stud Manufacturer Association
- B. ASTM A 780 - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
- C. ASTM A 1003 - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members.
- D. ASTM B 633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.
- E. ASTM C 955 - Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases.

- F. ASTM C 1513 - Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections.
- G. ASTM C1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories.
- H. AISI - Standard for Cold-Formed Steel Framing General Provisions.
- I. AISI - Specification for the Design of Cold-Formed Steel Structural Members.
- J. AWS D.1.3 - Structural Welding Code - Sheet Steel.

1.5 SUBMITTALS

- A. Submit under provisions of Section 01 3219.
- B. Product Data: Submit manufacturer's product literature, data sheets and installation recommendations for specified products.
- C. LEED Submittal: See Section 018113 LEED Certification Requirements for the following:
 - 1. Product Data for Credit MR 4.1 and Credit MR 4.2: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
 - a. Include statement indicating costs for each product having recycled content.
 - 2. MRc5 Regional Materials:
 - a. Sourcing location(s): indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery from the project site.
 - b. Manufacturing location(s): indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
 - c. Product Value: indicate dollar value of product containing regional materials; include materials costs only.
 - d. Product Component(s) Value: Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.
- D. Shop Drawings: ~~Show layout, spacings, sizes, thicknesses, and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.~~
 - 1. ~~For cold-formed metal framing indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.~~
- E. Welding certificates.
- F. Qualification Data: For testing agency.

COLD-FORMED METAL FRAMING

- G. Product Test Reports: From a qualified testing agency, unless otherwise stated, indicating that each of the following complies with requirements, based on evaluation of comprehensive tests for current products:
 1. Steel sheet.
 2. Expansion anchors.
 3. Power-actuated anchors.
 4. Mechanical fasteners.
 5. Vertical deflection clips.
 6. Horizontal drift deflection clips
 7. Miscellaneous structural clips and accessories.
- H. Research/Evaluation Reports: For cold-formed metal framing.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Installer experienced in performing work of this section who has specialized in installation of work similar to that required for this project.
- B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of cold-formed metal framing that are similar to those indicated for this Project in material, design, and extent.
- C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated.
- D. Product Tests: Mill certificates or data from a qualified independent testing agency indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.
- E. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."
- F. Fire-Test-Response Characteristics: Where indicated, provide cold-formed metal framing identical to that of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
- G. AISI Specifications and Standards: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed Steel Framing - General Provisions."
 1. Comply with AISI's "Standard for Cold-Formed Steel Framing - Truss Design."
 2. Comply with AISI's "Standard for Cold-Formed Steel Framing - Header Design."
- H. Comply with AISI's "Standard for Cold-Formed Steel Framing - Prescriptive Method for One and Two Family Dwellings."
- I. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- B. Store materials protected from exposure to rain, snow or other harmful weather conditions, at temperature and humidity conditions per the recommendations of ASTM C955.

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 absolute limits.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design: Dietrich Metal Framing; 500 Grant Street, Suite 2226, Pittsburgh, PA 15219. ASD. Tel: (412) 281-2805. Fax: (412) 281-2965. E-mail: askforhelp@dietrichindustries.com. Web: www.dietrichmetalframing.com.
- B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering cold-formed metal framing that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Allied Studco.
 - 2. AllSteel Products, Inc.
 - 3. California Expanded Metal Products Company.
 - 4. Clark Western Building Systems.
 - 5. Consolidated Fabricators Corp.; Building Products Division.
 - 6. Craco Metals Manufacturing, LLC.
 - 7. Custom Stud, Inc.
 - 8. Dale/Incor.
 - 9. Design Shapes in Steel.
 - 10. Dietrich Metal Framing; a Worthington Industries Company.
 - 11. Formetal Co. Inc. (The).
 - 12. Innovative Steel Systems.
 - 13. MarinoWare; a division of Ware Industries.
 - 14. Quail Run Building Materials, Inc.
 - 15. SCAFCO Corporation.
 - 16. Southeastern Stud & Components, Inc.
 - 17. Steel Construction Systems.
 - 18. Steeler, Inc.
 - 19. Super Stud Building Products, Inc.
 - 20. United Metal Products, Inc.

COLD-FORMED METAL FRAMING

2.2 COMPONENTS

- A. Studs: Cold formed galvanized steel C-studs; Dietrich Big "D" Steel C-Studs:
1. Sizes: As indicated on drawings.
 2. Minimum Yield Strength: As indicated on drawings.
 3. Minimum Delivered Thickness: 16 gauge, 0.0538 inch (1.37 mm).
- B. Runner Track: Cold formed galvanized steel sheet; Dietrich Big "D" Structural Runner Track:
1. Designation: Equal Leg.
 2. Minimum Yield Strength: 33 ksi (227 MPa) (for 20 through 12 gauges only).
 3. Web Sizes: As required to match the system stud size.
 4. Material thickness to match stud/joist thickness unless design dictates heavier thickness.
- C. SLP-TRK Systems - Slotted Deflection Track
1. Standard leg of 2 1/2 inches.
 2. Standard vertical slot of 1 1/2 inches in leg.
 3. Thickness: 16 gage (1.44 mm).
 4. Product available with 2 1/2 drift slots in web 'special order.'
 5. Minimum yield strength of 50 k.s.i. in 16 gauge and heavier.
- D. Deflection Clips:
1. Slide Clips: Minimum Delivered Thickness: 12 gauge, 0.0966 inch (2.45 mm).
 2. Fast Top Clip: Minimum Delivered Thickness: 14 gauge, 0.0677 inch (1.72 mm)
 3. Fast Strut Clip: Minimum Delivered Thickness: 14 gauge, 0.0677 inch (1.72 mm)
 4. Fast ClipSlide Clip: Minimum Delivered Thickness: 14 gauge, 0.0677 inch (1.72 mm)
 5. QuickClip: Minimum Delivered Thickness: 10 gauge, 0.1180 inch (3 mm)
- E. Bridging/Spacer Bar: Dietrich TradeReady Spazzer 5400 Bridging and Bracing Bar.
- F. Minimum Delivered Thickness: 16 gauge, 0.0538 inch (1.37 mm).
1. 1-1/4 by 1-1/4 by 50 inches (32 by 32 by 1270 mm) long pre-notched at 16 by 24 inches (406 by 610 mm) centers.
 2. Dietrich TradeReady Spazzer Bar Guard: Minimum Delivered Thickness: 20 gauge, 0.0329 inch (0.84 mm)
- G. Framing Component Accessories: Provide the following accessories as required for a complete system.
1. Flat strapping.
 2. Angles, plates, sheets.
 3. Custom brake-formed shapes.
- H. Fasteners: Self-drilling, self-tapping screws; Steel, complying with ASTM C1513; Galvanized coating, plated or oil-phosphate coated complying with ASTM B 633 as needed for required corrosion resistance.
- I. Touch-Up Paint: Zinc rich, containing 95-percent metallic zinc, ZRC 350 as manufactured by ZRC Worldwide, Marshfield, MA.

2.3 MATERIALS

- A. Cold-Formed Steel Sheet: Complying with SSMA, ICBO 4943P; unless indicated otherwise.
- B. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

2.4 FABRICATION

- A. General: Framing components may be pre-assembled into panels prior to erecting.
- B. Fabricate panels square, with components attached in a manner so as to prevent racking or distortion.
- C. Cut all framing components squarely for attachment to perpendicular members, or as required for an angular fit against abutting members. Hold members positively in place until properly fastened.
- D. Provide insulation as specified elsewhere in all double jamb studs and double header members, which will not be accessible to the insulation contractor.
- E. Axially Loaded Studs:
 - 1. Install studs to have full bearing against inside track web (1/8 inches (3.2 mm) maximum gap) prior to stud and track attachment.
 - 2. Splices in axially loaded studs are not permitted.
 - 3. Fasteners: Fasten components using self-tapping screws or welding.
- F. Welding: Welding is permitted on 18 gauge or heavier material only.
 - 1. Qualify welding operators in accordance with Section 6.0 of AWS D.1.3.
 - 2. Touch up all welds with zinc-rich paint in compliance with ASTM A 780.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Prior to installation, inspect previous work of all other trades. Verify that all work is complete and accurate to the point where this installation may properly proceed in strict accordance with framing shop drawings.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 ERECTION

- A. General Erection Requirements:
 - 1. Install cold-formed framing in accordance with requirements of ASTM C1007.
 - 2. Weld in compliance with AWS D.1.3.

COLD-FORMED METAL FRAMING

3. Install in compliance with applicable sections of the AISI Standard for Cold-Formed Steel Framing General Provisions.

B. Wall Systems:

1. Erect framing and panels plumb, level and square in strict accordance with approved shop drawings.
2. Handle and lift prefabricated panels in a manner so as not to cause distortion in any member.
3. Anchor runner track securely to the supporting structure as shown on the erection drawings. Install concrete anchors only after full compressive strength has been achieved. ~~Provide a sill sealer or gasket barrier between all concrete and steel connections where noted.~~
4. Butt all track joints. Securely anchor abutting pieces of track to a common structural element, or butt-weld or splice them together.
5. Align and plumb studs, and securely attach to the flanges or webs of both upper and lower tracks except when vertical movement is specified.
6. Install jack studs or cripples below window sills, above window and door heads, at freestanding stair rails and elsewhere to furnish support, securely attached to supporting members.
7. Attach wall stud bridging in a manner to prevent stud rotation. Space bridging rows according to manufacturer's recommendations.
8. Frame wall openings to include headers and supporting studs as shown in the drawings.
9. Provide temporary bracing until erection is completed.
10. Where indicated in the drawings, provide for structural vertical movement using a vertical slide clip or other means in accordance with manufacturer's recommendations.

3.3 PROTECTION

- A. Protect installed products until completion of project.
 1. Touch-up, repair or replace damaged products before Substantial Completion.

- END OF SECTION -

- SECTION 05 5000 -

METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Shop fabricated metal items and miscellaneous metal work to include the following:
 - 1. Steel framing and supports for applications where framing and supports are not specified in other Sections.
 - 2. Steel framing and supports (outriggers) for metal canopy including mounting brackets, frame and anchorages.
 - 3. Steel framing and supports for countertops.
 - 4. Steel weld plates and angles for casting into concrete not specified in other Sections.
 - 5. Elevator machine hoist beams
 - 6. Metal elevator pit ladder.
 - 7. Metal ship's ladder.
 - 8. Stainless steel embed plates at stairs.
 - 9. Abrasive metal nosings.
 - 10. Loose bearing and leveling plates for applications where they are not specified in other Sections.
- B. Products furnished, but not installed, under this Section:
 - 1. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete.
 - 2. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.

1.3 RELATED SECTIONS

- A. Section 03 3000 "Cast-in-Place Concrete" for installing anchor bolts, steel pipe sleeves, slotted-channel inserts, wedge-type inserts and other items cast into concrete.
- B. Section 05 1200 "Structural Steel Framing."
- C. Section 05 5100 "Metal Stairs" for fabricated architectural metal stairways.

- D. Section 05 5213 "Pipe and Tube Railings" for fabricated metal railing system to include structural plate balusters and tube horizontal rails.
- E. Section 05 7300 "Decorative Glass Railings."
- F. Section 09 9113 "Exterior Painting" for preparation, priming with compatible products and finish paint coatings.

1.4 QUALITY ASSURANCE

- A. Standards and References: (Latest Edition unless otherwise noted)
 - 1. 2003 International Building Code (IBC)
 - 2. American Society for Testing and Materials (ASTM) Specifications as listed in the Section.
- B. Submittals: Submit under provisions of Section 01 3219.
 - 1. Shop Drawings: Submit shop drawings indicating profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevation, and details where applicable. Indicate welded connections using standard AWS welding symbols. Indicate net weld lengths.
 - 2. Manufacturer's descriptive data: Submit for manufacturer's items.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver all parts ready for erection; store in close proximity to final locations.

1.6 PERFORMANCE REQUIREMENTS

- A. Thermal Movements: Provide exterior metal fabrications that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

1.7 SUBMITTALS

- A. Product Data: For the following:
 - 1. Nonslip aggregates and nonslip-aggregate surface finishes.
 - 2. Metal nosings and treads.
 - 3. Paint products.
 - 4. Grout.
- B. LEED Submittal:
 - 1. Product Data for Credit MR 4.1 and Credit MR 4.2: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.

METAL FABRICATIONS

- a. Include certificate indicating costs for each product having recycled content.
- 2. Product Data for Credit EQ 4.2: For paints, including printed statement of VOC content and chemical components.
- 3. Local/Regional Materials:
 - a. Sourcing location(s): Indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery and the project site.
 - b. Manufacturing location(s): Indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
 - c. Product Value: Indicate dollar value of product containing local/regional materials; include materials cost only.
 - d. Product Component(s) Value: Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.
- C. Shop Drawings: Show fabrication and installation details for metal fabrications.
 - 1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
 - 2. Provide templates for anchors and bolts specified for installation under other Sections.
- D. Mill Certificates: Signed by manufacturers of stainless-steel sheet certifying that products furnished comply with requirements.
- E. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article

1.8 PROJECT CONDITIONS

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

1.9 COORDINATION

- A. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- B. Coordinate installation of steel weld plates and angles for casting into concrete that are specified in this Section but required for work of another Section. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Aluminum Plate and Sheet: **ASTM B 209** (ASTM B 209M), Alloy 6061-T6.

- B. Aluminum Extrusions: **ASTM B 221** (ASTM B 221M), Alloy 6063-T6.
- C. Aluminum-Alloy Rolled Tread Plate: ASTM B 632/B 632M, Alloy 6061-T6.
- D. Aluminum Castings: ASTM B 26/B 26M, Alloy 443.0-F.
- E. Steel Sections: ASTM A36.
- F. Steel Tubing: ASTM A500, Grade B.
- G. Steel Pipe: ASTM A53, Type E or S, Grade. B.
- H. Steel Bolts, Nuts, and Washers: ASTM A307.
- I. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 304.
- J. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304.
- K. Welding Materials: AWS D1.1; type required for materials being welded.
- L. Galvanizing: Hot-dip process ASTM A123 typical and ASTM A153 for threaded fasteners performed after fabrication into largest practical section. Weight of coating not less than 2 oz. per sq. ft. of surface. Where damaged, repair surface with one coat of hot process galvanizing repair compound, "Galvalloy", Galvweldalloy", or approved equal.
- M. Primer: Tnemec Company "69 Special Red Primer", Rust Oleum Corporation "1069 Heavy Dusty Rust Inhibitor Red Primer", Sherwin-Williams "Kern Kromick Primer"; or approved equal.
- N. Dissimilar Materials: Separate dissimilar surfaces in contact with or in close proximity to non-compatible metals, concrete masonry, or plaster with neoprene gasket; or other approved means.
- O. Expansion Bolts: Hilti "Kwik Bolt TZ" Expansion Anchors, galvanized unless otherwise indicated.
- P. Non-shrink Grout: Master builders 928 or equal.

2.2 FABRICATION, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces, unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Form metal fabrications from materials of size, thickness, and shapes indicated but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of each metal fabrication.
- C. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.

METAL FABRICATIONS

- D. Allow for thermal movement resulting from the following maximum change (range) in ambient temperature in the design, fabrication, and installation of installed metal assemblies to prevent buckling, opening up of joints, and overstressing of welds and fasteners. Base design calculations on actual surface temperatures of metals due to both solar heat gain and nighttime sky heat loss.
1. Temperature Change (Range): 100 deg F.
- E. Shear and punch metals cleanly and accurately. Remove burrs.
- F. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- G. Remove sharp or rough areas on exposed traffic surfaces.
- H. Weld corners and seams continuously to comply with the following:
1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 2. Obtain fusion without undercut or overlap
 3. Remove welding flux immediately.
 4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing, and contour of welded surface matches those adjacent.
- I. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.
- J. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
- K. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- L. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- M. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

2.3 ROUGH HARDWARE

- A. Furnish bent, or otherwise custom-fabricated, bolts, plates, anchors, hangers, dowels, and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete or other structures. Straight bolts and other stock rough hardware items are specified in Division 6 Sections.

- B. Fabricate items to sizes, shapes, and dimensions required. Furnish malleable-iron washers for heads and nuts that bear on wood structural connections, and furnish steel washers elsewhere.

2.4 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports for applications indicated that are not a part of structural steel framework as required to complete the Work.
- B. Fabricate units to sizes, shapes, and profiles indicated and required to receive other adjacent construction retained by framing and supports. Fabricate from structural steel shapes, plates, and steel bars of welded construction using mitered joints for field connection. Cut, drill, and tap units to receive hardware, hangers, and similar items.
 - 1. Equip units with integrally welded anchors for casting into concrete or building into masonry. Furnish inserts if units must be installed after concrete is placed.
 - a. Except as otherwise indicated, space anchors 24 inches o.c. and provide minimum anchor units in the form of steel straps 1-1/4 inches wide by 1/4 inch thick by 8 inches long.
- C. Galvanize miscellaneous framing and supports in the following locations:
 - 1. Exterior locations.
 - 2. Interior locations where indicated.

2.5 MISCELLANEOUS STEEL TRIM

- A. Unless otherwise indicated, fabricate units from structural steel shapes, plates, and bars of profiles shown with continuously welded joints, and smooth exposed edges. Miter corners and use concealed field splices wherever possible.
- B. Provide cutouts, fittings, and anchorages as required to coordinate assembly and installation with other work. Provide anchors, welded to trim, for embedding in concrete or masonry construction, spaced not more than 6 inches from each end, 6 inches from corners, and 24 inches o.c., unless otherwise indicated.
- C. Galvanize miscellaneous steel trim in the following locations:
 - 1. Exterior locations.
 - 2. Interior locations where indicated.

2.6 ANGLE FRAMES AND EDGE ANGLES

- A. Lateral Supports for Storefronts:
 - 1. Structural steel angles, sized for spans and wind loads, to support storefronts to structures.
 - 2. Securely fasten angles to storefront and structure.
- B. Vanities and Countertops: Provide framing to support countertops.
- C. Complete with anchors and bolts. For casting in concrete, space anchors 24 inches OC with 1-1/4 inches by 1/4 inch by 8 inches steel straps.

METAL FABRICATIONS

- D. Finish: Universal primer.

2.7 OPERABLE PARTITION SUPPORTS

- A. Continuous steel shapes and beams of sizes indicated with attached bearing plates, anchors, and braces as indicated.
- B. Locate supports as required by manufacturer to suspend partitions from structure above without sags or undue deflection affection operation of partitions.

2.8 FIXED STEEL LADDERS

- A. General: Fabricate ladders for locations shown, with dimensions, spacings, details, and anchorages as indicated.
 - 1. Comply with ANSI A14.3, unless otherwise indicated.
- B. Siderails: Continuous, 1/4 inch x 3 inch steel flat bars, with eased edges, spaced as shown on Drawings.
- C. Bar Rungs: 3/4-inch-diameter steel bars, spaced 12 inches o.c.
- D. Fit rungs in centerline of side rails; plug-weld and grind smooth on outer rail faces.
- E. Support each ladder at top and bottom at intermediate points spaced and not more than 60 inches o.c. with welded or bolted steel brackets. Size brackets to support design loads specified in ANSI A14.3 and to hold centerline of ladder rungs clear of the wall surface by minimum 7 inches.
- F. Provide nonslip surfaces on top of each rung by coating with abrasive material metallically bonded to rung by a proprietary process.
 - 1. Products: Subject to compliance with requirements, provide one of the following
 - a. Mebac; IKG Borden.
 - b. SLIP-NOT; W. S. Molnar Company.

2.9 METAL SHIPS' LADDER

- A. Manufacturer: The design is based on ships ladder Model SL manufactured by Precision Ladders, Inc.
- B. Provide metal ships' ladders where indicated. Fabricate of open-type construction with channel or plate stringers, pipe and tube railings, and bar grating treads and landing, unless otherwise indicated. Provide brackets and fittings for installation.
 - 1. Fabricate ships' ladders, including treads and railings from aluminum.
 - 2. Stringers: Siderails shall be aluminum (6005-T5) channel 5 inches x 2 inches by 3/16 inch.
 - 3. Treads: Extruded aluminum (6005-T5) channel 5-3/16 inch x 2 feet 6 inches.
 - a. Deeply serrated aluminum channel treads, both welded and bolted to stringer.
 - 4. Mounting Brackets:
 - a. Floor: 2 inch x 3 inch x 1/4 inch aluminum angle.

- b. Top: 4-3/4 inch x 2 inch aluminum 5 inch angle.
- 5. Handrail:
 - a. 1-1/4 inch Schedule 40 aluminum pipe (6061 T-6).
 - b. External aluminum fittings.

2.10 LOOSE BEARING AND LEVELING PLATES

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

2.11 LOOSE STEEL LINTELS

- A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.
- B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span but not less than **8 inches (200 mm)** unless otherwise indicated.
- C. Galvanize loose steel lintels located in exterior walls.
- D. Prime loose steel lintels located in exterior walls with zinc-rich primer.

2.12 STEEL WELD PLATES AND ANGLES

- A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.13 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish metal fabrications after assembly.
- C. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.14 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.
 - 1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

METAL FABRICATIONS

- B. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete unless otherwise indicated.
1. Shop prime with universal shop primer unless primers specified in Division 9 Section "High-Performance Coatings" are indicated.
- C. Preparation for Shop Priming: Prepare surfaces to comply with requirements indicated below:
1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 3. Items Indicated to Receive Primers Specified in Division 9 Section 09 9113 "Exterior Painting": SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 4. Other Items: SSPC-SP 3, "Power Tool Cleaning."
- D. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
- E. Stainless Steel Finishes:
1. Remove tool and die marks and stretch lines or blend into finish.
 2. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.
 3. Bright, Directional Satin Finish: No. 4.
 4. Dull Satin Finish: No. 6.
 5. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 2. Obtain fusion without undercut or overlap.
 3. Remove welding flux immediately.

4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.
- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:
 1. Cast Aluminum: Heavy coat of bituminous paint.
 2. Extruded Aluminum: Two coats of clear lacquer.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.
- B. Support steel girders on concrete or steel pipe columns. Secure girders with anchor bolts embedded in concrete or with bolts through top plates of pipe columns.
 1. Where grout space under bearing plates is indicated for girders supported on concrete, install as specified in "Installing Bearing and Leveling Plates" Article.
- C. Install pipe columns on concrete footings with grouted baseplates. Position and grout column baseplates as specified in "Installing Bearing and Leveling Plates" Article.
 1. Grout baseplates of columns supporting steel girders after girders are installed and leveled.

3.3 INSTALLING NOSINGS, TREADS, AND THRESHOLDS

- A. Center nosings on tread widths unless otherwise indicated.
- B. For nosings embedded in concrete steps or curbs, align nosings flush with riser faces and level with tread surfaces.
- C. Seal thresholds exposed to exterior with elastomeric sealant complying with Division 7 Section "Joint Sealants" to provide a watertight installation.

3.4 INSTALLING BEARING AND LEVELING PLATES

- A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.
- B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.

METAL FABRICATIONS

1. Use nonshrink grout, either metallic or nonmetallic, in concealed locations where not exposed to moisture; use nonshrink, nonmetallic grout in exposed locations unless otherwise indicated.
2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.5 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 1. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.
- B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 9 painting Sections.
- C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780

3.6 SCHEDULE

- A. Provide and install items shown on Drawings with anchorage and attachment necessary for installation. The following Schedule lists principal items only. Refer to drawing details for items not specifically scheduled.
 1. Miscellaneous plates or angles not attached to structural steel; complete with anchorage for embedment.
 2. Steel pipe columns for supporting frame construction/ millwork
 3. Low wall tube steel bracing
 4. Steel weld plates and angles for casting into concrete not specified in other Sections.
 5. Metal elevator pit ladder.
 6. Metal ship's ladder.
 7. Loose bearing and leveling plates for applications where they are not specified in other Sections.
 8. Other items as indicated on drawings.

- END OF SECTION -

- SECTION 05 5100 -

METAL 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. This Section includes the following:
 - 1. Preassembled steel stairs with cast-in-place treads reinforced with W.W.F.
 - 2. Steel tube railings attached to metal stairs.
 - 3. Steel tube handrails attached to walls adjacent to metal stairs.

1.3 RELATED SECTIONS

- A. Section 05 1200 "Structural Steel".
- B. Section 05 5000 "Metal Fabrications" for ships' ladder.
- C. Section 05 7300 "Decorative Glass Railings" for ornamental metal railings attached to stairs, and tube railings attached to adjacent walls.
- D. Section 09 2116 "Non-Structural Metal Framing" for metal backing for anchoring railings.

1.4 REFERENCES

- A. Standards and References: (Latest Edition unless otherwise noted)
 - 1. 2001 California Building Code (CBC), Volumes 1, 2, 3
 - 2. American Society for Testing and Materials (ASTM) Specifications as listed in the Section.
 - 3. Federal Specifications (FS).
 - 4. American Institute of Steel Construction's "Specification for Structural Steel Buildings".
 - 5. American Welding Society's "Structural Welding Code" (AWS D1.1).
 - 6. American Iron and Steel Institute's "Specifications for Design of Light Gauge Cold-Formed Stainless Steel Structural Members".
 - 7. National Association of Architectural Metal Manufacturer's "Metal Stairs" (NAAMM-MS).

8. Steel Structures Painting Council's "Painting Manual":
 - a. Solvent Cleaning (SSPCC-SP 1).
 - b. Hand Tool Cleaning (SSPC-SP 2)
 - c. Brush-Off Blast Cleaning (SSPC-SP 7)
 - d. Hot Phosphate Surface treatment (SSPC-PT 4).
9. American Hot Dip Galvanizers Association, Inc. (AHDGA):
 - a. Inspection manual for hot dip galvanized products.

1.5 PERFORMANCE REQUIREMENTS

- A. Structural Performance of Stairs: Provide metal stairs capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 1. Uniform Load: 100 lbf/sq. ft. (4.79 kN/sq. m).
 2. Concentrated Load: 300 lbf (1.33 kN) applied on an area of 4 sq. in. (2580 sq. mm).
 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 for pre-fabricated stair system to L/240 or 1/4 inch (6.4 mm), whichever is less.
 6. Limit deflection of treads, platforms, and framing members for monumental stair system to L/360 or 1/4 inch (6.4 mm), whichever is less.
- B. Structural Performance of Railings: Provide railings as specified under Division 5 "Metal Railing Systems" capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 1. Handrails:
 - a. Uniform load of 50 lbf/ ft. (0.73 kN/m) applied in any direction.
 - b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 2. Top Rails of Guards:
 - a. Uniform load of 50 lbf/ ft. (0.73 kN/m) applied in any direction 50 lbf/ ft. (0.73 kN/m) applied horizontally and concurrently with 100 lbf/ ft. (1.46 kN/m) applied vertically downward.
 - b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 3. Infill of Guards:
 4. Concentrated load of 200 lbf (0.89 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m).
 5. Uniform load of 25 lbf/sq. ft. (1.2 kN/sq. m) applied horizontally.
 6. Infill load and other loads need not be assumed to act concurrently.
- C. Seismic Performance: Provide metal stairs capable of withstanding the effects of earthquake motions determined according to loads per California Building Code, 2001 Edition.
 1. Coordinate with drawings, see Structural General Notes.

1.6 SUBMITTALS

- A. Product Data: For metal stairs and the following:
 - 1. Paint products.
- B. LEED Submittal:
 - 1. Product Data for Credit MR 4.1: Indicating percentages by weight of postconsumer and preconsumer recycled content for products having recycled content.
 - a. Include certification indicating costs for each product having recycled content.
 - 2. Product Data for Credit EQ 4.2: For paints, including printed statement of VOC content and chemical components.
 - 3. Local/Regional Materials:
 - a. Sourcing location(s): Indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery and the project site.
 - b. Manufacturing location(s): Indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
 - c. Product Value: Indicate dollar value of product containing local/regional materials; include materials cost only.
 - d. Product Component(s) Value: Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.
- C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. Provide templates for anchors and bolts specified for installation under other Sections.
 - 2. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the California registered professional engineer responsible for their preparation.
 - 3. Show a large scale construction of various parts, methods of joining, thickness of metals, profiles of surfaces, reinforcing, anchorage, and structural supports. Include information regarding concealed and exposed joints, welds, and fastenings.
 - 4. Where welded connectors and concrete inserts are required to receive work, show size and locations required.
- D. Samples for Initial Selection: For products involving selection of color, texture, or design.
- E. Welding certificates.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.
- B. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM AMP 510, "Metal Stairs Manual," for class of stair designated, unless more stringent requirements are indicated.
- C. Welding: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1, "Structural Welding Code--Steel."
 - 2. AWS D1.3, "Structural Welding Code--Sheet Steel."

- D. Design Criteria:
 - 1. Built-up parts shall not exhibit warp.

1.8 COORDINATION

- A. 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.
- B. Coordinate locations of hanger rods and struts with other work so that they will not encroach on required stair width and will be within the fire-resistance-rated stair enclosure.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

2.2 METALS, GENERAL

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

2.3 FERROUS METALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Steel Tubing: ASTM A 500 (cold formed), Grade A.
- C. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.
- D. Uncoated, Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, structural steel, **Grade 25 (Grade 170)**, unless another grade is required by design loads; exposed elements.
- E. Uncoated, Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, either commercial steel, Type B, or structural steel, **Grade 30 (Grade 205)**, unless another grade is required by design loads.
- F. Woven-Wire Mesh: Intermediate-crimp, square pattern, **2-inch (50-mm)** woven-wire mesh, made from **0.135-inch (3.5-mm)** nominal diameter wire complying with **ASTM A 510 (ASTM A 510M)**.

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2.4 FASTENERS

- A. General: Provide zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 25 for exterior use, and Class Fe/Zn 5 where built into exterior walls. Select fasteners for type, grade, and class required.
- B. Expansion Anchors: Anchor bolt and sleeve assembly with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
 - 1. Material for Anchors in Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.
 - 2. Material for Anchors in Exterior Locations: Alloy Group stainless-steel bolts complying with and nuts complying with .

2.5 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79.
 - 1. Use primer with a VOC content of 250 g/L (2.1 lb/gal.) or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 2. Dry film thickness: 1.0 – 1.3 mil.
- C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.
- D. Concrete Materials and Properties: Comply with requirements in Division 3 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of **3000 psi (20 MPa)**, unless otherwise indicated.
- E. Nonslip-Aggregate Concrete Finish: Comply with Section 03 3500 "Concrete Finishing".
- F. Welded Wire Fabric: ASTM A 185, **6 by 6 inches (152 by 152 mm)**--W1.4 by W1.4, unless otherwise indicated.

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. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately **1/32 inch (1 mm)**, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work true to line and level with accurate angles and surfaces and straight edges.
- E. Weld 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. Architectural Finish:
 - a. Weld exposed corners and seams continuously, unless otherwise indicated.
 - b. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts unless otherwise indicated. Locate joints where least conspicuous.
- G. Fabricate joints that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- H. Specialty Fabricated Products:
 - 1. Preparation:
 - a. Coordinate with other work supporting or adjoining miscellaneous metal and verify requirements for cutting out, fitting, and attaching.
 - b. Verify sizes, designs, and locations of items; do so at site whenever construction progress permits.
 - 2. General Requirements:
 - a. Fabricate items from materials noted and make true to profiles shown. Obtain the Architect's approval of proposed variations.
 - b. Miter corners and angles of frames and moldings unless otherwise noted.
 - c. Perform cutting, shearing, drilling, punching, threading, tapping as required for items or their adjacent work.
 - d. Drill or punch holes; do not use cutting torch.
 - e. Ensure shearing and punching leaves true lines and surfaces.
 - f. Items to be Galvanized: Fabricate in accordance with recommended practices of ASTM A385 and A386 unless specifically noted otherwise.
 - g. Fabricate exterior items for assembly and installation on site without field-welding of joint.
 - h. Ensure metal thickness and assembly details provide ample strength and stiffness.
 - i. Size sleeves for approximately 1/4-inch clearance all around.
 - 3. Fastening:
 - a. Provide fasteners and anchor assemblies required for complete fabrication, field assembly, and erection.
 - b. Conceal fastenings wherever practicable.

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- c. Size internally threaded diameters to accommodate galvanized threaded bolts where galvanizing is required.
 - d. Permanent connections in Ferrous Metal Items: Employ welding wherever practicable; avoid bolts and screws.
4. Welding:
- a. Use electric shielded-arc process according to AWS D1.1.
 - b. Maintain shape and profile of item welded.
 - c. Prevent heat blisters, run-throughs, and surface distortions.
 - d. Welds Normally Exposed to View in Finished Work: Make uniform and grind smooth.

2.7 STEEL-FRAMED STAIRS

- A. Stair Framing:
1. Fabricate stringers of steel tubes.
 - a. Provide closures for exposed ends of tube stringers.
 2. Construct platforms of steel tube headers and miscellaneous framing members as needed to comply with performance requirements.
 3. Weld stringers to headers; weld framing members to stringers and headers.
 4. Where stairs are enclosed by gypsum board shaft-wall assemblies, provide hanger rods or struts to support landings from floor construction above or below, unless otherwise indicated on drawings. Locate hanger rods and struts where they will not encroach on required stair width and will be within the fire-resistance-rated stair enclosure.
- B. Abrasive-Coating-Finished, Formed-Metal Stairs: Form risers, treads, and platforms to configurations shown from steel sheet of thickness needed to comply with performance requirements but not less than 0.0966 inch (2.5 mm).
1. Steel Sheet: Uncoated hot-rolled steel sheet, unless otherwise indicated.
 2. Directly weld risers and treads to stringers; locate welds on underside of stairs.
 3. Provide platforms of configuration indicated or, if not indicated, the same as treads. Weld platforms to platform framing.
 4. Finish tread and platform surfaces with manufacturer's standard epoxy-bonded abrasive finish.

2.8 STEEL TUBE RAILINGS

- A. General: 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. Configuration: 1-1/2-inch- (38-mm-) square top and bottom rails and posts with infill panels made from woven wire mesh crimped into 1-by-1/2-by-1/8-inch (25-by-13-by-3-mm) steel channel frames.
 - a. Premium woven wire mesh, 2-inch by 2-inch pattern.
 - b. Orient wire mesh with wires perpendicular and parallel to top rail.

- B. 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.
- C. Form changes in direction of railings as follows:
 - 1. As detailed.
 - 2. By bending or by inserting prefabricated elbow fittings.
 - 3. By inserting prefabricated elbow fittings.
- D. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- 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 (6 mm)** or less.
- G. 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. Connect posts to stair framing by direct welding, unless otherwise indicated.
 - 2. For nongalvanized railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves, except galvanize anchors embedded in exterior masonry and concrete construction.
- H. 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. Preparation of Surfaces:
 - 1. Thoroughly clean mill scale, rust, dirt, grease, and other foreign matter from ferrous metal prior to galvanizing, hot phosphate treatment or painting.
 - 2. Where hand cleaning methods are not adequate, clean in accordance with SSPC-SP 1, SSPC-SP 2, or SSPC-SP 7 as required.
 - 3. Completely eliminate burrs, rough spots and pitting from normally exposed ferrous metal items.
- B. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- C. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed products:
 - 1. Interior Stairs (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."

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

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Examine areas to receive work and verify that: Setting conditions and dimensions are correct to receive items.
- B. Do not start installation until unsatisfactory conditions have been corrected.
- C. Install work plumb, true, rigid, and neatly trimmed out.
- D. Do not tighten fastener through finish alone without spacer washers.
- E. Provide concrete inserts or predrilled expansion bolts in fastening items into concrete.
- F. Protect dissimilar metals from contact with each other or with other materials causing corrosion.
- G. Fasten work tightly to prevent rattle or vibration except where expansion-contraction tolerances are required.
- H. Use nonshrink grout mixed in accordance with manufacturer's direction for setting frames, plates, sills, bolts and similar items.
- I. Set items shown or required to be installed in sleeves with quick-setting anchor cement unless otherwise noted.
- J. Protect metal from damage to surface, profile and shape.
- K. 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.
- L. 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.
- M. Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete, unless otherwise indicated.
- N. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

- O. 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.
- P. Field Welding: Comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- Q. Place and finish concrete fill for treads and platforms to comply with Division 3 Section "Cast-in-Place Concrete."
 - 1. Install abrasive nosings with anchors fully embedded in concrete. Center nosings on tread width.

3.2 INSTALLING METAL STAIRS WITH GROUTED BASE PLATES

- A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of baseplates.
 - 1. Remove protective devices only when items will be safe from other construction operations or removal is required to permit related work.
 - 2. Clean prime-coated items as required for finish painting.
- B. Set steel stair baseplates on wedges, shims, or leveling nuts. After stairs have been positioned and aligned, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.
 - 1. Use nonmetallic, nonshrink grout, unless otherwise indicated.
 - 2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.3 INSTALLING STEEL TUBE 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 directly 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. Provide bracket with 1-1/2-inch (38-mm) clearance from inside face of handrail and finished wall surface. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads. Secure wall brackets to building construction as follows:
 - 1. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt.
 - 2. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.

METAL STAIRS

3. For steel-framed gypsum board assemblies, fasten brackets directly to steel framing or concealed steel reinforcements using self-tapping screws of size and type required to support structural loads.

3.4 ADJUSTING AND CLEANING

- A. Touchup: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1.
 1. Apply by brush or spray to provide a minimum **2.0-mil (0.05-mm)** dry film thickness.
- B. Painting: Cleaning and painting of metal stair system are specified in Division 9 "High Performance Painting" section.
- C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780

- END OF SECTION -

- SECTION 05 5213 -**PIPE & TUBE RAILINGS**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Steel plate and tube guardrail systems.
 - 2. Steel pipe and tube hand stair railings.

1.3 RELATED SECTIONS

- A. Section 05 5100 "Metal Stairs" for prefabricated metal stairs.
- B. Section 05 7300 "Decorative Glass Railings" for ornamental metal railings and guardrails with glass and metal infill panels.
- C. Section 09 2216 "Non-Structural Metal Framing" for metal backing for anchoring railings.
- D. Section 09 9113 "Exterior Painting" for field applied durable paint finish.

1.4 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide railings capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Handrails:
 - a. Uniform load of 50 lbf/ ft. (0.73 kN/m) applied in any direction.
 - b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 - 2. Top Rails of Guards:
 - a. Uniform load of 50 lbf/ ft. (0.73 kN/m) applied in any direction.
 - b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 - 3. Infill of Guards:

- a. Concentrated load of 50 lbf (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m).
- b. Uniform load of 25 lbf/sq. ft. (1.2 kN/sq. m) applied horizontally.
- c. Infill load and other loads need not be assumed to act concurrently.

1.5 SUBMITTALS

- A. Product Data: For the following:
 1. Grout, anchoring cement, and paint products.
- B. LEED Submittal:
 1. Product Data for Credit MR 4.1 and Credit MR 4.2: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
 - a. Include certification indicating costs for each product having recycled content.
 2. Product Data for Credit EQ 4.2: For paints, including printed statement of VOC content and chemical components.
 3. Local/Regional Materials:
 - a. Sourcing location(s): Indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery and the project site.
 - b. Manufacturing location(s): Indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
 - c. Product Value: Indicate dollar value of product containing local/regional materials; include materials cost only.
 - d. Product Component(s) Value: Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.
- C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- D. Samples for Verification: For each type of wood finish required.
 1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters.
 2. Fittings and brackets.
- E. Mill Certificates: Signed by manufacturers of stainless-steel products certifying that products furnished comply with requirements.
- F. Welding certificates.
- G. Qualification Data: For professional engineer.

1.6 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of railing component through one source from a single manufacturer.
- B. Welding: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1, "Structural Welding Code--Steel."

1.7 PROJECT CONDITIONS

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

1.8 COORDINATION AND SCHEDULING

- A. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- B. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Steel Pipe and Tube Railings:
 - a. Pisor Industries, Inc.
 - b. Sharpe Products.
 - c. Wagner, R & B, Inc.; a division of the Wagner Companies.
- B. Railing systems may be fully fabricated by a qualified metal shop meeting the requirements of this section.

2.2 METALS, GENERAL

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

2.3 STEEL AND IRON

- A. Tubing: ASTM A 500 (cold formed) or ASTM A 513, Type 5 (mandrel drawn).
- B. Pipe: ASTM A 53/A 53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.
- C. Plates, Shapes, and Bars: ASTM A 36/A 36M.

2.4 FASTENERS

- A. General: Provide the following:
 - 1. Steel Railings: Plated steel fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating.
- B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.
- C. Fasteners for Interconnecting Railing Components:
 - 1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless otherwise indicated.
- D. Anchors: Provide cast-in-place chemical or torque-controlled expansion anchors, fabricated from corrosion-resistant materials with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

2.5 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Zinc-Rich Primer: Complying with SSPC-Paint 20 or SSPC-Paint 29 and compatible with topcoat.
 - 1. Use primer with a VOC content of 250 g/L (2.1 lb/gal.) or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 2. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Benjamin Moore & Co.; Epoxy Zinc-Rich Primer CM18/19.
 - b. Carboline Company; Carbozinc 621.
 - c. ICI Devoe Coatings; Catha-Coat 313.
 - d. International Coatings Limited; Interzinc 315 Epoxy Zinc-Rich Primer.
 - e. PPG Architectural Finishes, Inc.; Aquapon Zinc-Rich Primer 97-670.
 - f. Sherwin-Williams Company (The); Corothane I GalvaPac Zinc Primer.
 - g. Tnemec Company, Inc.; Tneme-Zinc 90-97.

- C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.
- D. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.6 FABRICATION

- A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.
- B. Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately **1/32 inch (1 mm)**, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- D. Form work true to line and level with accurate angles and surfaces.
- E. Fabricate connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- G. Connections: Fabricate railings with either welded or nonwelded connections, unless otherwise indicated.
- H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove flux immediately.
 - 4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
- I. Nonwelded Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
- J. Form changes in direction as follows:
 - 1. By bending or by inserting prefabricated elbow fittings.
 - 2. By inserting prefabricated elbow fittings.

- K. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- L. Close exposed ends of railing members with prefabricated end fittings.
- M. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is **1/4 inch (6 mm)** or less.
- N. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work, unless otherwise indicated.
 - 1. At brackets and fittings fastened to plaster or gypsum board partitions, provide fillers made from crush-resistant material, or other means to transfer wall loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.
- O. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.
- P. For railing posts set in concrete, provide steel sleeves not less than **6 inches (150 mm)** long with inside dimensions not less than **1/2 inch (13 mm)** greater than outside dimensions of post, with steel plate forming bottom closure.
- Q. Toe Boards: Where indicated, provide toe boards at railings around openings and at edge of open-sided floors and platforms. Fabricate a continuous 2-inch high by 1/4-inch deep toe board along all stair landings and balcony edges.

2.7 STEEL AND IRON FINISHES

- A. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed railings:
 - 1. Interior Railings Indicated to Receive Zinc-Rich Primer (SSPC Zone 1A): SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION, GENERAL

- A. Fit exposed connections together to form tight, hairline joints.

PIPE & TUBE RAILINGS

- B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
 - 1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
 - 2. Set posts plumb within a tolerance of **1/16 inch in 3 feet (2 mm in 1 m)**.
 - 3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed **1/4 inch in 12 feet (5 mm in 3 m)**.
- C. Adjust railings before anchoring to ensure matching alignment at abutting joints.
- D. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

- A. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Use wood blocks and padding to prevent damage to railing members and fittings. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of railings.
- B. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in Part 2 "Fabrication" Article whether welding is performed in the shop or in the field.

3.4 ANCHORING POSTS

- A. Form or core-drill holes not less than **5 inches (125 mm)** deep and **3/4 inch (20 mm)** larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.
- B. Cover anchorage joint with flange of same metal as post, attached to post with set screws, at enclosed stairwells.
- C. Leave anchorage joint exposed; wipe off surplus anchoring material; and leave **1/8-inch (3-mm)** buildup, sloped away from post.
- D. Anchor plate balusters to metal surfaces with oval flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:
 - 1. For steel pipe railings, weld flanges to post and bolt to metal supporting surfaces.

3.5 ATTACHING HANDRAILS TO WALLS

- A. Attach handrails to wall with wall brackets. Provide brackets with **1-1/2-inch (38-mm)** clearance from inside face of handrail and finished wall surface.
- B. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

- C. Secure wall brackets to building construction as follows:
 - 1. For steel-framed gypsum board partitions, use hanger or lag bolts set into steel backing between studs. Coordinate with stud installation to locate backing members.

3.6 ADJUSTING AND CLEANING

- A. Clean aluminum and stainless steel by washing thoroughly with clean water and soap and rinsing with clean water.
- B. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

3.7 PROTECTION

- A. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

- END OF SECTION -

- SECTION 05 7300 -

DECORATIVE GLASS RAILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Tempered glass railing assemblies at interior stairs.

1.3 RELATED SECTIONS

- A. Section 08 8000 "Glazing" for tempered glazing.

1.4 REFERENCES

- A. ASTM A 666 – Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
- B. ASTM B 221 – Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- C. ASTM B 248 – Standard Specification for General Requirement for Wrought Copper and Copper-Alloy Plate, Sheet, Strip, and Rolled Bar.
- D. ASTM B 633 – Standard Specification for Normalized High-Strength Low-Alloy Structural Steel Plates.
- E. ASTM C 595 – Standard Specification for Blended Hydraulic Cements.
- F. ASTM C 1048 – Standard Specification for Heat-Treated Flat Glass-Kind HS, Kind FT Coated and Uncoated Glass.
- G. ASTM E 488 – Standard Test Method for Strength of Anchors in Concrete and Masonry Element.
- H. AWS D1.1 – Structural Welding Code-Steel.

- I. SSPC-SP 6/NACE No. 3, Commercial Blast Cleaning.

1.5 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Systems shall comply with California Building Code, including Chapters 10, 11B and 24, Sections 2406.4 and 2406.6. Provide railings capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Handrail Assembly:
 - a. Distributed load of **50-lbs per sq. ft.** applied horizontally at right angles to the handrail.
 - b. Concentrated horizontal load of **200-lbs** applied in any direction at any point along handrail system.
 - c. Distributed loads and concentrated loads not to be applied simultaneously.

1.6 SUBMITTALS

- A. Product Data: For expansion cement and fasteners.
- B. LEED Submittals:
 - 1. Product Data for Credit MR 4.1 and Credit MR 4.2: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating costs for each product having recycled content.
- C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by a civil engineer licensed in the State of California responsible for their preparation.
- D. Samples for Verification:
 - 1. Sections of each distinctly different linear railing member, including handrails, top rails, and posts.
 - 2. Fittings and brackets.
- E. Mill Certificates: Signed by manufacturers of stainless-steel products certifying that products furnished comply with requirements.
- F. Welding certificates.
- G. Qualification Data: For civil engineer.

1.7 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of railing component through one source from a single manufacturer.
- B. Welding: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1, "Structural Welding Code-Steel."

DECORATIVE GLASS RAILINGS

1.8 PROJECT CONDITIONS

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

1.9 COORDINATION AND SCHEDULING

- A. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to project site in time for installation.
- B. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. Tempered Glass Railing Assemblies:
 - 1. P & P Artec, Dale, IL.
 - 2. Blumcraft.
 - 3. Livers Bronze Co.
 - 4. Or equal.

2.2 METALS

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

2.3 MATERIALS, GENERAL

- A. Stainless Steel: ASTM A 666, Type 304.

2.4 COMPONENTS

- A. Handrails: 304 stainless steel pipe, 1-1/2-inch diameter with a 360-400 grit finish.
- B. Balusters: One single baluster post, 304 stainless steel pipe 1-1/4-inch O.D. with a 360-400 grit finish.
- C. Frame Tubes: Hard drawn stainless steel tube 5/8-inch O.D. with a 360-400 grit finish.

- D. Connection Fittings: Solid cast zinc, powder coated, color as selected by Architect.
- E. In-fill Panel Glazing: Fully tempered ASTM C 1048 Kind FT, Quality q3. As specified in Section 08 8000.
 - 1. Thickness: 1/2-inch, all four sided polished.
 - 2. Color: Clear.
- F. Bolts, Screws and Nuts: 304 Stainless steel. Do not use metals that will be corrosive and incompatible with materials being fastened.
- G. Mixes: Red Head Ceramic 6 Epoxy to cast baluster into concrete.

2.5 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

2.6 FABRICATION

- A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.
- B. Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately **1/32-inch**, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- D. Form work true to line and level with accurate angles and surfaces.
- E. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- F. Connections: Fabricate railings with either welded or nonwelded connections, unless otherwise indicated.
- G. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove flux immediately.
 - 4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
- H. Nonwelded Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.

DECORATIVE GLASS RAILINGS

- I. Form changes in direction as follows:
 - 1. By bending or by inserting prefabricated elbow fittings.
 - 2. By inserting prefabricated elbow fittings.
- J. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- K. Close exposed ends of railing members with prefabricated end fittings.
- L. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is **1/4-inch** or less.
- M. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work, unless otherwise indicated.
 - 1. At brackets and fittings fastened to plaster or gypsum board partitions, provide fillers made from crush-resistant material, or other means to transfer wall loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.
- N. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.
- O. Mounting of railing system: Side mount with baluster foot.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION, GENERAL

- A. Fit exposed connections together to form tight, hairline joints.
- B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
 - 1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
 - 2. 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. Adjust railings before anchoring to ensure matching alignment at abutting joints.

- D. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

- A. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Use wood blocks and padding to prevent damage to railing members and fittings. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of railings.
- B. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in Part 2 "Fabrication" Article whether welding is performed in the shop or in the field.

3.4 ATTACHING HANDRAILS TO GLASS / GLAZING

- A. Attach handrails to glazing with concealed surface mounted hand railing bracket. Provide brackets with 1-1/2-inch minimum clearance from inside face of handrail and finished wall surface.
 - 1. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt.
- B. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

3.5 ADJUSTING AND CLEANING

- A. Clean stainless steel by washing thoroughly with clean water and soap and rinsing with clean water.
- B. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

3.6 PROTECTION

- A. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

- END OF SECTION -

DIVISION 06 – WOODS & PLASTICS

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- SECTION 06 1053 -**MISCELLANEOUS ROUGH CARPENTRY**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Wood blocking and nailers.
 - 2. Plywood backing panels.

1.3 RELATED SECTIONS

- A. Section 01 74 19 "Materials Recycling & Waste Management".
- B. Section 01 81 13 "LEED Certification Requirements".
- C. Section 06 4023 "Interior Architectural Woodwork" for nonstructural carpentry items exposed to view and not specified in another section.

1.4 DEFINITIONS

- A. Dimension Lumber: Lumber of 2 inches nominal (38 mm actual) or greater but less than 5 inches nominal (114 mm actual) in least dimension.
- B. Lumber grading agencies, and the abbreviations used to reference them, include the following:
 - 1. NeLMA: Northeastern Lumber Manufacturers' Association.
 - 2. NHLA: National Hardwood Lumber Association.
 - 3. NLGA: National Lumber Grades Authority.
 - 4. SPIB: The Southern Pine Inspection Bureau.
 - 5. WCLIB: West Coast Lumber Inspection Bureau.
 - 6. WWPA: Western Wood Products Association.

1.5 SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
 2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
 3. For fire-retardant treatments specified to be High-Temperature (HT) type include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
 4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
 5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.
- B. LEED Submittals: See Section 018113 LEED Certification Requirements for the following:
1. Product Data for Credit EQ 4.1: For adhesives, including printed statement of VOC content.
 2. Product Data for Credit EQ 4.4: For composite-wood products, documentation indicating that product contains no urea formaldehyde.
 3. Certificates for Credit MR 7: Chain-of-custody certificates certifying that products specified to be made from certified wood comply with forest certification requirements. Include evidence that mill is certified for chain of custody by an FSC-accredited certification body.
 4. MRc4 Recycled Content: Product data for products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content.
 - a. Include cost information for each product having recycled content.
- C. Include statement indicating costs for each certified wood product.
- D. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:
1. Preservative-treated wood.
 2. Fire-retardant-treated wood.
 3. Power-driven fasteners.
 4. Powder-actuated fasteners.
 5. Expansion anchors.
 6. Metal framing anchors.

1.6 DELIVERY, STORAGE, AND HANDLING

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

- B. Deliver interior wood materials that are to be exposed to view only after building is enclosed and weatherproof, wet work other than painting is dry, and HVAC system is operating and maintaining temperature and humidity at occupancy levels.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
 - 1. Factory mark each piece of lumber with grade stamp of grading agency.
 - 2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece or omit grade stamp and provide certificates of grade compliance issued by grading agency.
 - 3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
 - 4. Provide dressed lumber, S4S, unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS (PT)

- A. Preservative Treatment by Pressure Process: AWPA C2, except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated according to AWPA C31 with inorganic boron (SBX).
 - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
 - 2. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do 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 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 or omit marking and provide certificates of treatment compliance issued by inspection agency.
- D. Application: Treat items indicated on Drawings, and the following:
 - 1. Wood blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 - 2. Wood blocking and similar concealed members in contact with masonry or concrete.

2.3 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Comply with performance requirements in AWPA C20 (lumber) and AWPA C27 (plywood).
 - 1. Use treatment that does not promote corrosion of metal fasteners.
 - 2. Use Exterior type for exterior locations and where indicated.
 - 3. Use Interior Type A, High Temperature (HT) for enclosed roof framing, framing in attic spaces, and where indicated.
 - 4. Use Interior Type A, unless otherwise indicated.
- B. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.
- C. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not bleed through, contain colorants, or otherwise adversely affect finishes.
- D. Application: Treat items indicated on Drawings, and the following:
 - 1. Concealed blocking.
 - 2. Plywood backing panels.

2.4 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
 - 1. Blocking.
 - 2. Nailers.
- B. For items of dimension lumber size, provide Construction or No. 2 grade lumber with 19 percent maximum moisture content of any of the following species:
 - 1. Hem-fir (north); NLGA.
 - 2. Spruce-pine-fir; NLGA.
 - 3. Hem-fir; WCLIB, or WWPA.
 - 4. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
 - 5. Western woods; WCLIB or WWPA.
- C. For blocking not used for attachment of other construction Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.
- D. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.
- E. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

MISCELLANEOUS ROUGH CARPENTRY

2.5 PLYWOOD BACKING PANELS

- A. Telephone and Electrical Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 1/2-inch (13-mm) nominal thickness.

2.6 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
1. Where carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: NES NER-272.
- D. Wood Screws: ASME B18.6.1.
- E. Screws for Fastening to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.
- F. Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M).
- G. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.
- H. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.
1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.
 2. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2 (ASTM F 738M and ASTM F 836M, Grade A1 or A4).

2.7 METAL FRAMING ANCHORS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Cleveland Steel Specialty Co.
 2. Harlen Metal Products, Inc.
 3. KC Metals Products, Inc.
 4. Simpson Strong-Tie Co., Inc.
 5. Southeastern Metals Manufacturing Co., Inc.

6. USP Structural Connectors.
- C. Galvanized Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 (Z180) coating designation.
 1. Use for interior locations where stainless steel is not indicated.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, and similar supports to comply with requirements for attaching other construction.
- B. Framing Standard: Comply with AF&PA's "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- C. Metal Framing Anchors: Install metal framing to comply with manufacturer's written instructions.
- D. Do not splice structural members between supports, unless otherwise indicated.
- E. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
 1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches (406 mm) o.c.
- F. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:
 1. 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 (2438 mm) 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- (38-mm actual-) thickness.
- G. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- H. 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.
- I. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 1. NES NER-272 for power-driven fasteners.

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2. Table 23-II-B-1, "Nailing Schedule," and Table 23-II-B-2, "Wood Structural Panel Roof Sheathing Nailing Schedule," in ICBO's Uniform Building Code.

- J. 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 between members. Install fasteners without splitting wood; do not countersink nail heads, unless otherwise indicated.

3.2 WOOD BLOCKING, AND NAILER INSTALLATION

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

3.3 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.

3.4 PROTECTION

- A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.
- B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

- END OF SECTION -

- SECTION 06 1600 - SHEATHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Wall sheathing.
 - 2. Roof (sloped parapet) sheathing.
 - 3. Parapet sheathing.
 - 4. Building paper.
 - 5. Sheathing joint-and-penetration treatment.
 - 6. Flexible flashing at openings in sheathing.

1.3 RELATED SECTIONS

- A. Section 01 74 19 "Materials Recycling & Waste Management".
- B. Section 01 81 13 "LEED Certification Requirements".
- C. Section 05 1200 "Structural Steel" for sloped parapet framing.
- D. Section 05 4000 "Cold Formed Metal Framing" for exterior framed walls
- E. Section 06 1053 "Miscellaneous Rough Carpentry" for plywood backing panels.
- F. Section 07 4213 "Metal Plate Wall Panels" for installation of metal plate wall panels over building wrap.
- G. Section 07 4243 "Composite Wall Panels" for installation of composite wall panels over building wrap.
- H. Section 09 2070 "Metal Lath and Accessories" for metal lath installation over exterior wall sheathing.

1.4 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 products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
 4. For building wrap, include data on air-/moisture-infiltration protection based on testing according to referenced standards.
- B. LEED Submittal: See Section 018113 LEED Certification Requirements for the following:
1. MRc4 Recycled Content: Product data for products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content.
 - a. Include cost information for each product having recycled content.
 2. MRc5 Regional Materials:
 - a. Sourcing location(s): indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery from the project site.
 - b. Manufacturing location(s): indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
 - c. Product Value: indicate dollar value of product containing regional materials; include materials costs only.
 - d. Product Component(s) Value: Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.
 3. MRc7 Certified Wood: Provide Chain-of-custody certificates that products specified to be made from certified wood comply with forest certification requirements. Include evidence that mill is certified for chain-of-custody by FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship".
 - a. Include cost information for each certified wood product.
 4. EQc4.1 Adhesives & Sealants: Product data for adhesives & sealants, including printed statement of VOC content and chemical components.
 5. EQc4.4 Composite Wood & Agri-fiber:
 - a. Provide documentation indicating that product contains no added urea formaldehyde.
- C. Provide documentation indicating that the bonding agent or adhesive contains no added urea formaldehyde.
- D. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:
1. Preservative-treated plywood.

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2. Fire-retardant-treated plywood.

1.5 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: For assemblies with fire-resistance ratings, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
 1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory."

1.6 DELIVERY, STORAGE, AND HANDLING

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

PART 2 - PRODUCTS

2.1 WOOD PANEL PRODUCTS, GENERAL

- A. Plywood: Either DOC PS 1 or DOC PS 2, unless otherwise indicated.
- B. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.
- C. Factory mark panels to indicate compliance with applicable standard.

2.2 PRESERVATIVE-TREATED PLYWOOD

- A. Preservative Treatment by Pressure Process: AWPA C9.
 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
- B. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.
- C. Application: Treat items indicated on Drawings and plywood in contact with masonry or concrete or used with roofing, flashing, vapor barriers, and waterproofing.

2.3 WALL SHEATHING

- A. Glass-Mat Gypsum Wall Sheathing: ASTM C 1177/1177M.
 1. Product: Subject to compliance with requirements, provide "Dens-Glass Gold" and "Dens-Glass Gold Fireguard" by G-P Gypsum Corporation.
 2. Type and Thickness:
 - a. Type X, 5/8 inch (15.9 mm) thick.
 3. Size: 48 by 96 inches (1219 by 2438 mm) for vertical installation.

2.4 ROOF (SLOPED PARAPET) SHEATHING

- A. Plywood Roof Sheathing: Exterior, Structural I sheathing.
 - 1. Span Rating: Not less than 40/20.
 - 2. Nominal Thickness: Not less than **5/8 inch (15.9 mm)** unless otherwise noted.

2.5 PARAPET SHEATHING

- A. Substrate Board: ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum substrate, Type X, **5/8 inch (16 mm)** thick for installation on the inside face of parapet walls.
 - 1. Products: Subject to compliance with requirements, provide the following:
 - a. Georgia-Pacific Corporation; Dens Deck.

2.6 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
 - 1. For wall sheathing, provide fasteners of Type 304 stainless steel.
 - 2. For roof and parapet sheathing, provide fasteners of Type 304 stainless steel and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening substrate board to roof deck and framing.
- B. Power-Driven Fasteners: NES NER-272.
- C. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing board to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.
 - 1. For steel framing less than **0.0329 inch (0.835 mm)** thick, attach sheathing to comply with ASTM C 1002.
 - 2. For steel framing from **0.033 to 0.112 inch (0.84 to 2.84 mm)** thick, attach sheathing to comply with ASTM C 954.

2.7 WEATHER-RESISTANT SHEATHING PAPER

- A. Building Paper: UBC Standard 14-1, Grade D (water-vapor-permeable, kraft building paper), except that water resistance shall be not less than 1 hour and water-vapor transmission shall be not less than 75 g/sq. m x 24 h.

2.8 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

- A. Sealant for Paper-Surfaced Glass-Mat Gypsum Sheathing Board: Silicone emulsion sealant complying with ASTM C 834, compatible with sheathing tape and sheathing, and recommended by tape and sheathing manufacturers for use with glass-fiber sheathing tape and for covering exposed fasteners.

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- B. Sheathing Tape for Glass-Mat Gypsum Sheathing Board: Self-adhering glass-fiber tape, minimum **2 inches (50 mm)** wide, **10 by 10 or 10 by 20 threads/inch (390 by 390 or 390 by 780 threads/m)**, of type recommended by sheathing and tape manufacturers for use with silicone emulsion sealant in sealing joints in glass-mat gypsum sheathing board and with a history of successful in-service use.

2.9 MISCELLANEOUS MATERIALS

- A. Adhesives for Field Gluing Panels to Framing: Formulation complying with ASTM D 3498 that is approved for use with type of construction panel indicated by manufacturers of both adhesives and panels.
1. Use adhesives that have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Flexible Flashings: Self-adhesive, self-sealing SBS modified asphalt waterproof membrane laminated to high density, cross-laminated polyethylene film reinforcement to produce an overall thickness of not less than **0.025 inch (0.6 mm)** and **0.040 inch (1.0 mm)** where indicated.
1. Products: Subject to compliance with requirements, provide the following
 - a. Fortifiber Building Systems Group; Fortiflash 25 and Fortiflash 40.
- C. Primer for Flexible Flashing: Product recommended by manufacturer of flexible flashing for substrate.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction, unless otherwise indicated.
- C. Securely attach to substrate by fastening as indicated, complying with the following:
1. NES NER-272 for power-driven fasteners.
 2. Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code."
- D. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.
- E. Coordinate wall and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
- F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

- G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 GYPSUM SHEATHING INSTALLATION

- A. Comply with GA-253 and with manufacturer's written instructions.
 - 1. Fasten gypsum sheathing to wood framing with screws.
 - 2. Fasten gypsum sheathing to cold-formed metal framing with screws.
 - 3. Install boards with a **3/8-inch (9.5-mm)** gap where non-load-bearing construction abuts structural elements.
 - 4. Install boards with a **1/4-inch (6.4-mm)** gap where they abut masonry, concrete or similar materials that might retain moisture, to prevent wicking.
- B. Apply fasteners so heads bear tightly against face of sheathing boards but do not cut into facing.
- C. Horizontal Installation: Attach exterior sheathing to metal framing with screws spaced 8 inches o.c. at perimeter where there are framing supports and 8 inches o.c. along intermediate framing in field. Abut ends of boards over centers of studs, and stagger end joints of adjacent boards not less than one stud spacing. Attach boards at perimeter and within field of board to each steel stud.
 - 1. Space fasteners approximately **8 inches (200 mm)** o.c. and set back a minimum of **3/8 inch (9.5 mm)** from edges and ends of boards.
- D. Vertical Installation: Apply panels perpendicular to supports, with end joints staggered and located over supports.
 - 1. Install with 1/4-inch (6.4-mm) open space where panels abut other construction or structural penetrations.
 - 2. Fasten with corrosion-resistant screws.

3.3 WEATHER-RESISTANT SHEATHING-PAPER INSTALLATION

- A. General: Cover sheathing with weather-resistant sheathing paper as follows:
 - 1. Cut back barrier **1/2 inch (13 mm)** on each side of the break in supporting members at expansion- or control-joint locations.
 - 2. Apply barrier to cover vertical flashing with a minimum **4-inch (100-mm)** overlap, unless otherwise indicated.
- B. Building Paper: Apply horizontally with a **2-inch (50-mm)** overlap and a **6-inch (150-mm)** end lap; fasten to sheathing with galvanized staples or roofing nails.
- C. Building Wrap: Comply with manufacturer's written instructions.
 - 1. Seal seams, edges, fasteners, and penetrations with tape.
 - 2. Extend into jambs of openings and seal corners with tape.

3.4 SHEATHING JOINT-AND-PENETRATION TREATMENT

- A. Seal sheathing joints according to sheathing manufacturer's written instructions.

SHEATHING

1. Apply elastomeric sealant to joints and fasteners and trowel flat. Apply sufficient quantity of sealant to completely cover joints and fasteners after troweling. Seal other penetrations and openings.
2. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing board joints, and apply and trowel silicone emulsion sealant to embed entire face of tape in sealant. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.
3. Apply sheathing tape to joints between foam-plastic sheathing panels and at items penetrating sheathing. Apply at upstanding flashing to overlap both flashing and sheathing.

3.5 FLEXIBLE FLASHING INSTALLATION

- A. Apply flexible flashing where indicated to comply with manufacturers written instructions.
 1. Prime substrates as recommended by flashing manufacturer.
 2. Lap seams and junctures with other materials at least **4 inches (100 mm)**, except that at flashing flanges of other construction, laps need not exceed flange width.
 3. Lap flashing over weather-resistant building paper at bottom and sides of openings.
 4. Lap weather-resistant building paper over flashing at heads of openings.
 5. After flashing has been applied, roll surfaces with a hard rubber or metal roller to ensure that flashing is completely adhered to substrates.

3.6 PROTECTION

- A. Paper-Surfaced Gypsum Sheathing: Protect sheathing by covering exposed exterior surface of sheathing with weather-resistant sheathing paper securely fastened to framing. Apply covering immediately after sheathing is installed.

- END OF SECTION -

SECTION 06 2614**SOLID MINERAL PROFILE PANELING**

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Solid mineral profile paneling and seam finishing materials to create a monolithic sculptured wall surface.
- B. Products Supplied But Not Installed/Used Under This Section: Following components of Installation Kit:
1. Dry Mix Joint Compound.
 2. Acrylic Fortifier.
 3. Low-VOC Adhesive.
 4. Low- VOC Primer Sealer.
 5. Countersink Drill Bit with Depth Stop-Collar.
 6. Flexible Spreader(s).
 7. Sandpaper.
 8. Pre-measured Plastic Container.
 9. Measuring Cup.
- C. Related Sections:
1. 09 29 00—Gypsum Board: Substrate and seam finishing.
 2. 09 91 23—Interior Painting: Sealing and painting of profile paneling.

1.02 REFERENCES

- A. American Society for Testing and Materials (ASTM):
1. [ASTM D 256](#) Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics.
 2. [ASTM D 638](#) Standard Test Method for Tensile Properties of Plastics.
 3. [ASTM D 696](#) Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30 °C and 30 °C With a Vitreous Silica Dilatometer.

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4. [ASTM D 790](#) Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
5. [ASTM D 2583](#) Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor.
6. [ASTM E 84](#) Standard Test Method for Surface Burning Characteristics of Building Materials.

1.03 SUBMITTALS

A. Reference Section 01 33 00–Submittal Procedures; submit following items:

1. Product Data.
2. Project List: Minimum 5 previous completed projects including contact name and e- mail address or telephone number for each project.
3. Shop Drawings: Standard installation details.
4. Samples: Minimum 15 by 15 inch solid mineral panel of specified design(s).
5. Quality Assurance/Control Submittals:
 - a. Qualifications: Proof of manufacturer, installer, and finisher qualifications.
 - b. Manufacturer's Installation Instructions.

1.04 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer Qualifications: Minimum five years experience in producing mineral profile paneling.
2. Installer Qualifications: Minimum three years experience in finish carpentry/architectural woodwork installation.

B. Field Samples: Provide in a location selected by Architect showing representative sample of installed product including finished seam.

1. Minimum Size: [8 by 8 feet]
2. Approved field samples may remain as part of completed Work.

C. Pre-Installation Meeting:

1. Convene meeting at project site within one week of scheduled start of installation with representatives of the following in attendance: Owner, Architect, General Contractor, Installer, Finisher, and Painter.
2. Review substrate conditions, requirements of related work, installation, seam finishing, and painting instructions, and storage and handling procedures.
3. Keep minutes of meeting including responsibilities of various parties and deviations from specifications and installation instructions.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Follow manufacturer's instructions.
 - 1. Store panels in fully enclosed space, protected against damage from moisture, direct sunlight, and surface contamination.
 - 2. Store panels vertically, in shipping crates, until ready to be installed. Loosen crate lidsto allow for venting. Do not stack or lean against walls.
 - 3. Store panels in area of installation minimum 24 hours prior to installation.

1.06 PROJECT/SITE CONDITIONS

- A. Environmental Requirements for Installation:
 - 1. HVAC: Operate HVAC system to maintain occupancy level temperature and relative humidity conditions (35 to 67 percent) in the area of installation from 24 hours prior to delivery of panels to the installation area through remainder of construction period.
 - 2. Lighting: Permanent project lighting, including any special lighting used to highlight the profiled panels, must be operational prior to seam finishing.

1.07 SEQUENCING

- A. Seam Finishing: Depending on scheduling of other Work, seam finishing may be required after completion of other gypsum board finishing work.
- B. Lighting: Permanent project lighting must be installed and be operational prior seam finishing.

PART 2 - PRODUCTS

2.01 MANUFACTURER

- A. Modular Arts, Inc.

4215 - 23rd Avenue West	Tel: 206.788.4210
Seattle, WA 98199	Fax: 206.788.4214
	E-mail: info@modularArts.com
	Website: www.modularArts.com
- B. Product: Modular Arts Solid Mineral Profile Paneling.
 - 1. Design: Dune.
- C. Substitutions: None permitted.

2.02 MATERIALS

- A. Profile Panel: 32 by 32 by 1 inch maximum profile relief, smooth surface solid mineral composite panel containing no retardants, accelerators, release agents, or plastics.
 - 1. Physical Properties:
 - a. Tensile Strength: ASTM D 638 960 psi.

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b.	Modulus of Elasticity: ASTM D 638	1970 ksi.
c.	Flexural Strength: ASTM D 790	550 psi.
d.	Flexural Modulus: ASTM D 790	360 ksi.
e.	Izod Impact Strength: ASTM D 256	9.4 ft-lb/in ² .
f.	Hardness: ASTM D 2583	60 Barcol.
g.	Thermal Expansion: ASTM D 696	3.8x10 ⁻⁷ in/in
h.	Compressive Strength: ASTM D 696	2.3 ksi.
i.	Flame Spread Index: ASTM E 84	0
j.	Smoke Development Index: ASTM E 84	0
k.	Weight (for all designs excluding YUMA)	2.5 psf
l.	Weight (for YUMA design only)	3.8 psf

B. Installation Kit: Item quantities in parenthesis denote quantities for (Small Kit—up to 50 panels/Large Kit—up to 100 panels).

1. Dry Mix Joint Compound: One 18 lb bag BEADEx® brand SILVER SET™ 40, or SHEETROCK® brand EASY SAND™ 45.
2. Acrylic Fortifier: (One/Two) quart THORO® ACRYL 60®.
3. Construction Adhesive: (8/16) 10.2 oz tubes PL® Polyurethane Premium Construction Adhesive.
4. Primer Sealer: (2/4) gal RODDA PAINT HORIZON Interior Wall Sealer No. 5035011.
5. Countersink Drill Bit with Depth Stop-Collar: (One/Two) No. 7.
6. Flexible Spreader: (One/Two) MUDTOOLS SMT-Y2
7. Sandpaper: (15/30) sheets No-Load 220G, (10/20) sheets No-Load 150G.
8. Plastic Container: One 100 oz.
9. Measuring Cup: One 8 oz.

2.03 ACCESSORIES

- A. Anchors: 30 lb self-drilling, drywall anchor.
- B. Screws: Coarse thread, drywall type, length as required by panel design and in accordance with Manufacturer's Installation Instructions.

2.04 SOURCE QUALITY CONTROL

- A. Fabrication Tolerances:
 1. Dimensions, length and width: +/- 1/16 inch.
 2. Thickness: +/- 1/16 inch.
 3. Weight: +/- 0.5 lb

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates upon which profile paneling will be installed.
 - 1. Verify that substrate is a material listed as an acceptable substrate by the profile paneling manufacturer.
- B. Verify that permanent project lighting is in place and operational prior to start of seam finishing.
- C. Coordinate with responsible entity to correct unsatisfactory conditions.
- D. Commencement of work by installer is acceptance of substrate conditions.

3.02 INSTALLATION

- A. Install profile paneling in accordance with Manufacturer's Installation Instructions except that seam finishing shall be performed under Section 09 29 00–Gypsum Board, and sealing and painting shall be performed under Section 09 91 23–Interior Painting.

3.03 CLEANING

- A. Reference Section 01 74 00–Cleaning and Waste Management.

END OF SECTION

- SECTION 06 4023 -

INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Interior standing and running trim.
 - 2. Plastic-laminate cabinets.
 - 3. Plastic-laminate countertops.
 - 4. Plastic-laminate shelving.
 - 5. Shop finishing of interior woodwork.

1.3 DEFINITIONS

- A. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items, unless concealed within other construction before woodwork installation.

1.4 RELATED SECTIONS

- A. Section 01 74 19 "Materials Recycling & Waste Management".
- B. Section 01 81 13 "LEED Certification Requirements".
- C. Section 06 1053 "Miscellaneous Rough Carpentry" for blocking to attach millwork and shelving.
- D. Section 06 6500 "Solid Polymer Fabrications" for solid surfacing materials and countertops.
- E. Section 12 3640 "Stone Countertops" for stone countertops.
- F. Section 12 3661 "Quartz Surfacing Countertops" for fabricated solid engineered countertops.
- G. Section 12 3200 "Manufactured Wood Casework" for modular plastic laminate wood cabinets and epoxy countertops.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated, including cabinet hardware and accessories, and 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 Verification: For the following:
 - 1. Veneer leaves representative of and selected from flitches to be used for transparent-finished woodwork.
 - 2. Veneer-faced panel products with or for transparent finish, **12 by 24 inches (300 by 600 mm)**, for each species and cut. Include at least one face-veneer seam and finish as specified.
 - 3. Plastic-laminate-clad panel products, 8 by 10 inches, for each type, color, pattern, and surface finish and specified edge material applied to 1 edge.
 - 4. Thermoset decorative-panels (MCP), **8 by 10 inches (200 by 250 mm)**, for each type, color, pattern, and surface finish, with edge banding on 1 edge.
 - 5. Corner pieces as follows:
 - a. Cabinet-front frame joints between stiles and rails, as well as exposed end pieces, **18 inches (450 mm) high by 18 inches (450 mm) wide by 6 inches (150 mm) deep.**
- D. LEED Submittals See Section 018113 LEED Certification Requirements for the following:
 - 1. Product Data for Credit EQ 4.1: For installation adhesives, including printed statement of VOC content.
 - 2. Product Data for Credit EQ 4.4:
 - a. For each composite-wood product used, documentation indicating that the bonding agent contains no urea formaldehyde.
 - b. For each adhesive used, documentation indicating that the adhesive contains no urea formaldehyde.
 - 3. Product Data for Credit(s) MR 4.1 and MR 4.2: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content
 - a. Include statement indicating costs for each product having recycled content.
 - 4. MRc5 Regional Materials:
 - a. Sourcing location(s): indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery from the project site.
 - b. Manufacturing location(s): indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
 - c. Product Value: indicate dollar value of product containing regional materials; include materials costs only.
 - d. Product Component(s) Value: Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.

- 5. Certificates for Credit MR 7: Chain-of-custody certificates certifying that products specified to be made from certified wood comply with forest certification requirements. Include evidence that mill is certified for chain of custody by an FSC-accredited certification body.
 - a. Include statement indicating costs for each certified wood product.
- E. Product Certificates: Signed by manufacturers of woodwork certifying that products furnished comply with requirements.
- F. Woodwork Quality Standard Compliance Certificates: WI-certified compliance certificates.
- G. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.6 QUALITY ASSURANCE

- A. Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production and installation of interior architectural woodwork.
- B. Industry Standards:
 - 1. Casework construction and installation shall meet or exceed minimum requirements of Woodwork Institute (WI) – Manual of Millwork, eleventh edition except as otherwise specified herein.
 - 2. Casework construction and installation details shall comply with standard WI details and applicable seismic criteria of California Building Code (CBC).
 - 3. Issue WI Certified Compliance Certificate after fabrication and prior to shipping casework to work site.
 - a. Each unit of casework shall bear the WI Certificate Compliance Label.
 - b. Each countertop shall the bear the WI Certificate Compliance Label.
- C. Millwork specified shall be manufactured in accordance with the standards established in the Manual of Millwork of the Woodwork Institute of California, current edition, in the grade or grades hereinafter specified or as shown on the drawings. If the manufacturer of millwork is not a WIC licensee, Contractor shall furnish to Architect, prior to installation, a Certificate of Reinspection by the WIC indicating that the millwork in question meets the requirements of the WIC grade specified. If the manufacturer of millwork is a WIC licensee, each unit of millwork shall bear the WIC Certified Compliance grade stamp indicating the grade specified, and by the completion of the job WIC Certified Compliance Certificates shall be provided indicating the grade specified. The foregoing shall not be construed to limit the power and authority of Architect to reject millwork which does not, in Architect's opinion, meet with any one or more of the specifications of the contract.
- D. Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production of interior architectural woodwork with sequence-matched wood veneers.
- E. Forest Certification: Provide interior architectural woodwork produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."

- F. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

1.7 DELIVERY, STORAGE, AND HANDLING

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

1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and will maintaining temperature between 60 and 90 deg F and relative humidity between 17 and 50 percent during the remainder of the construction period.
- B. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed and indicate measurements on Shop Drawings.

1.9 COORDINATION

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

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Provide materials that comply with requirements of the WI's quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.
- B. Wood Species and Cut for Transparent Finish: FSC Certified, White Fir, plain sliced.
- C. Wood Products: Comply with the following:
 - 1. Hardboard: AHA A135.4.
 - 2. Medium-Density Fiberboard: ANSI A208.2., Grade MD, made with binder containing no urea formaldehyde.
 - 3. Particleboard: ANSI A208.1.
 - 4. Softwood Plywood: DOC PS 1.
 - 5. Hardwood Plywood and Face Veneers: HPVA HP-1.

- D. Thermoset Decorative Overlay: Particleboard complying with ANSI A208.1, Grade M-2, or medium-density fiberboard complying with ANSI A208.2, Grade MD, with surface of thermally fused, melamine-impregnated decorative paper complying with LMA SAT-1.
 - 1. Provide PVC edge banding complying with LMA EDG-1 on components with exposed or semiexposed edges.
- E. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated, or if not indicated, as required by woodwork quality standard.
 - 1. Basis-of-Design Product: The District's Standard is based on Pionite: Pioneer Plastics Corp., Auburn, ME 207.784.9111 or 800.777.8113, NO SUBSTITUTIONS ALLOWED.
- F. Adhesive for Bonding Plastic Laminate: Contact cement, for general use and for postforming. Use unpigmented product with through-color laminate.
 - 1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.
- G. Tempered Float Glass for Cabinet Doors: ASTM C 1048, Kind FT, Condition A, Type I, Class 1 (clear), Quality-Q3, 6 mm thick, unless otherwise indicated.
- H. Mirror Glass for Cabinet back: ASTM C 1503, Mirror Select, Quality-Q3, 6.0 mm thick.
- I. Tempered Float Glass for Cabinet Shelves: ASTM C 1048, Kind FT, Condition A, Type I, Class 1 (clear), Quality-Q3; with exposed edges seamed before tempering, 6 mm thick.

2.2 INSTALLATION MATERIALS

- A. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

2.3 FABRICATION, GENERAL

- A. Interior Woodwork Grade: Provide premium grade interior woodwork complying with the referenced quality standard.
- B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.
- C. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:
 - 1. Corners of Cabinets and Edges of Solid-Wood (Lumber) Members 3/4 Inch Thick or Less: 1/16 inch.
 - 2. Edges of Rails and Similar Members More Than 3/4 Inch Thick: 1/8 inch.
- D. Complete fabrication, including assembly, finishing, and hardware application, to maximum extent possible, before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

1. Notify Architect seven days in advance of the dates and times woodwork fabrication will be complete.
 2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements indicated on Shop Drawings before disassembling for shipment.
- E. Shop cut openings, to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

2.4 INTERIOR STANDING AND RUNNING TRIM FOR TRANSPARENT FINISH

- A. General: Comply with referenced Woodworking Institute (WI)'s "Manual of Millwork quality standard's requirements for factory finishing."
- B. Wood Species and Cut: Match species and cut indicated for other types of transparent-finished architectural woodwork located in same area of building, unless otherwise indicated.
- C. Grade: Custom.
- D. Heights: As indicated on Drawings.
- E. Finish wood veneered wall panels and trim off-site in a controlled environment.
- F. Transparent Finish: Comply with requirements indicated for grade, finish system, staining effect, and sheen.
 1. Grade: Premium.
 2. Finish: WI System #8 UV curable coating.
 3. Effect: Open-grain finish.
 4. Sheen: Satin.
- G. 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.
- H. Assemble casings in plant except where limitations of access to place of installation require field assembly.

2.5 PLASTIC-LAMINATE CABINETS

- A. Grade: Premium.
- B. WI Construction Style: Style A, Frameless.
- C. WI Construction Type: Type I, multiple self-supporting units rigidly joined together.
- D. WI Door and Drawer Front Style: Flush overlay.

- E. Laminate Cladding for Exposed Surfaces: High-pressure decorative laminate complying with the following requirements:
 - 1. Horizontal Surfaces Other Than Tops: Grade HGS.
 - 2. Postformed Surfaces: Grade HGP.
 - 3. Vertical Surfaces: Grade VGS.
 - 4. Edges: Rigid PVC extrusions, through color with satin finish
 - a. 3 mm thick at doors and drawer fronts.
 - b. 1 mm thick elsewhere.
- F. Materials for Semiexposed Surfaces:
 - 1. Surfaces Other Than Drawer Bodies: White MCP.
 - a. Edges of Plastic-Laminate Shelves: Same as laminate cladding on horizontal surfaces.
 - b. For semiexposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, Grade CLS. Color selected by Architect.
 - 2. Drawer Sides and Backs: Solid-hardwood lumber.
 - 3. Drawer Bottoms: Thermoset decorative panels.
- G. Concealed Backs of Panels with Exposed Plastic Laminate Surfaces: High-pressure decorative laminate, Grade BKL.
- H. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
 - 1. Match Architect's sample, unless otherwise noted on drawings.
- I. Provide dust panels of 1/4-inch (6.4-mm) plywood or tempered hardboard above compartments and drawers, unless located directly under secured countertops in the following locations:
 - 1. Provide to secure cabinets with lockable drawers and when where locks are keyed differently between drawers.

2.6 CABINET HARDWARE AND ACCESSORIES

- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets provided under this Section.
- B. Hardware Standard: Comply with BHMA A156.9 for items indicated by referencing BHMA numbers or items referenced to this standard.
- C. Hinges: Stainless-steel, 3-knuckle hinges complying with BHMA A156.9, Grade 1, with antifriction bearings and rounded tips. Provide 2 for doors 48 inches (1200 mm) high or less and 3 for doors more than 48 inches (1200 mm) high.
 - 1. RPC, Satin Finish.
- D. Door and Drawer Pulls: Builders Brass Works No. 5438630.
- E. Shelf Rests: Engstrom #11.

- F. Brush and Extrusion Wire Manager: Doug Mocket & Company BREXT2 – 2” brush grommet and plastic extrusion cut and mitered to fit. Color: Matte Black
- G. Drawer Slides: Side-mounted, full-extension, zinc-plated steel drawer slides with steel ball bearings, BHMA A156.9, B05091, similar those manufactured by Knappe & Vogt; rated for the following loads:
 - 1. Typical drawers, overtravel design, 100 lb. Capacity: K&V, Model 8405 ANO.
 - 2. Heavy drawers, overtravel design, 150 lb. Capacity: K&V, Model 8505 ANO.
 - 3. Shallow drawers, full extension, low profile, 65 lb. Capacity: Accuride, Model 2632.
 - 4. File drawers, 1-inch overtravel, 150 lb. Capacity, three-section slide, 0.63 inch slide space: K&V, Model 8505 ANO.
- H. Cabinet drawer/door locks: Olympus Lock, Inc., pin tumbler operation, re-keyable and capable of being master keyed. Wafer tumbler locks will not be acceptable.
 - 1. Products:
 - a. Door Lock: Model No. 100DR Deadbolt Cabinet Door Lock.
 - b. Drawer Lock: Model No. 200DW Deadbolt Cabinet Drawer Lock.
 - 2. Provide locks at all drawers, single doors and on active leaf of paired doors.
 - 3. Provide 2 keys for each lock.
 - 4. Coordinate locks and latches specified below. At pairs of doors, active leaf shall have lock and inactive leaf shall have elbow catch.
 - 5. Keying: Assist Owner with developing a key schedule for drawer locks when shop drawings are reviewed. Coordinate with keying requirements specified in Section 08 7111 “Door Hardware”.
- I. Grommets for Cable Passage through Countertops: 3-inch OD, molded-plastic grommets and matching plastic caps with slot for wire passage except as noted otherwise. Color to be selected by the Architect for manufactures standard colors.
 - 1. Manufacture: Outwater Plastic Industries, Inc or approved equal.
- J. Casework Hardware Finish: ANSI/BHMA A 156.18.
 - 1. Exposed hardware: Chrome plated or stainless steel, brushed finish, as follows:
 - a. Chrome, satin brushed finish, plated on steel: BHMA 652 (US26D)
 - b. Chrome, satin brushed finish, plated on brass or bronze: BHMA 626 (US26D).
 - c. Stainless steel, brushed: BHMA 630 (US32D).
 - 2. Concealed hardware: Polished or satin chrome or brushed stainless steel.
- K. Label Holders: Stainless steel, aluminum, or chrome plated; sized to receive commercially available, standard office type name badges (e.g. Avery 74552 – 2 inch x 3 inch (51 by 76 mm) Name Badges) that can be printed using standard office computer applications (e.g. Microsoft Word) and standard office printers, attached with screws or rivets. Provide on all casework doors and drawers.

2.7 PLASTIC-LAMINATE COUNTERTOPS

- A. Quality Standard: Comply with Woodwork Institute (WI) Manual of Woodwork, Section 16 Custom Grade requirements for high-pressure decorative laminate countertops.

- B. Grade: Custom.
- C. See Shop Drawings for laminate grades, laminate colors, edge treatment, countertop core material.

2.8 PLASTIC-LAMINATE SHELVING

- A. Grade: Custom.
- B. WI Construction Style: Style A, Frameless.
- C. WI Construction Type: Type I, multiple self-supporting units rigidly joined together.
- D. WI Door Front Style: Flush overlay.
- E. Reveal Dimension: 1/2 inch (13 mm).
- F. Laminate Cladding for Exposed Surfaces: High-pressure decorative laminate complying with the following requirements:
 - 1. Horizontal Surfaces Other Than Tops: Grade HGS.
 - 2. Postformed Surfaces: Grade HGP.
 - 3. Vertical Surfaces: Grade VGS.
 - 4. Edges: PVC T-mold matching laminate in color, pattern, and finish.
- G. Materials for Semiexposed Surfaces:
 - 1. Surfaces Other Than Drawer Bodies: Thermoset decorative panels.
 - a. Edges of Plastic-Laminate Shelves: PVC T-mold matching laminate in color, pattern, and finish.
 - b. For semiexposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, Grade CLS.
- H. Concealed Backs of Panels with Exposed Plastic Laminate Surfaces: High-pressure decorative laminate, Grade BKL.
- I. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
 - 1. Nevamar Corp., Color: As indicated on Drawings.
- J. Provide dust panels of 1/4-inch (6.4-mm) plywood or tempered hardboard above compartments and drawers, unless located directly under tops.

2.9 SHOP FINISHING

- A. General: Finish architectural woodwork at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.

- B. Preparations for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural woodwork, as applicable to each unit of work.
 - 1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of woodwork. Apply two coats to back of paneling and to end-grain surfaces. Concealed surfaces of plastic-laminate-clad woodwork do not require backpriming when surfaced with plastic laminate, backing paper, or thermoset decorative overlay.
- C. Transparent Finish:
 - 1. Grade: Premium.
 - 2. WI Finish System 3b.: Catalyzed vinyl lacquer.
 - 3. Staining: Match Architect's sample.
 - 4. Wash Coat for Stained Finish: Apply wash-coat sealer to woodwork made from closed-grain wood before staining and finishing.
 - 5. Open Finish for Open-Grain Woods: Do not apply filler to open-grain woods.
 - 6. Filled Finish for Open-Grain Woods: After staining (if any), apply paste wood filler to open-grain woods and wipe off excess. Tint filler to match stained wood.
 - a. Apply wash-coat sealer after staining and before filling.
- D. Sheen: Satin, 31-45 gloss units measured on 60-degree gloss meter per ASTM D 523.

PART 3 - EXECUTION

3.1 PREPARATION

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

3.2 INSTALLATION

- A. Grade: Install woodwork to comply with requirements for the same grade specified in Part 2 for fabrication of type of woodwork involved.
- B. Assemble woodwork and complete fabrication at Project site to comply with requirements for fabrication in Part 2, to extent that it was not completed in the shop.
- C. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 1/8 inch in 96 inches.
- D. Scribe and cut woodwork to fit adjoining work, and refinish cut surfaces and repair damaged finish at cuts.
- E. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use

fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.

- F. 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 plastic wood filler, sand smooth, and finish same as wood base, if finished.
 2. Install wall railings on indicated metal brackets securely fastened to wall framing.
 3. Install standing and running trim with no more variation from a straight line than 1/8 inch in 96 inches.
- G. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
1. Install cabinets with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
 2. Maintain veneer sequence matching of cabinets with transparent finish.
 3. Fasten wall cabinets through back, near top and bottom, at ends and not more than 16 inches (400 mm) o.c. with No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish.
- H. Wood Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
1. Install cabinets with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
 2. Maintain veneer sequence matching of cabinets with transparent finish.
- I. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
1. Align adjacent solid-surfacing-material countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
 2. Install countertops with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
 3. Secure backsplashes to tops with concealed metal brackets at 16 inches (400 mm) o.c. and to walls with adhesive.
 4. Calk space between backsplash and wall with sealant specified in Division 7 Section "Joint Sealants."
- J. Complete the finishing work specified in this Section to extent not completed at shop or before installation of woodwork. Fill nail holes with matching filler where exposed. Apply specified finish coats, including stains and paste fillers if any, to exposed surfaces where only sealer/prime coats were applied in shop.

3.3 ADJUSTING AND CLEANING

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

- END OF SECTION -

- SECTION 06 6400 -

**FIBERGLASS REINFORCED PLASTIC WALL
PANELS (FRP)**

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. Shop Drawings: Show location and dimension of joints and fastener attachments.
- B. Product Data: Manufacturer's Specifications and installation instructions for each material and accessory.
- C. Submit specified color and texture sample of wall panel and trim pieces for verification.
- D. Submit cleaning and maintenance instructions.

1.3 RELATED SECTIONS

- A. Section 01 81 13 "LEED Certification Requirements".

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. LEED Submittals: See Section 018113 LEED Certification Requirements for the following:
 - 1. Product Data for Credit EQ 4.1: For adhesives and sealants, including printed statement of VOC content and chemical components.
 - 2. Product Data for Credit EQ 4.4: For laminating adhesive and composite wood products used in factory-laminated plastic panels, indicating that product contains no urea formaldehyde.
 - 3. MRc4 Recycled Content: Product data for products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content.
 - a. Include cost information for each product having recycled content.

4. MRc5 Regional Materials:
 - a. Sourcing location(s): indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery from the project site.
 - b. Manufacturing location(s): indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
 - c. Product Value: indicate dollar value of product containing regional materials; include materials costs only.
 - d. Product Component(s) Value: Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.
- C. Samples for Initial Selection: For plastic paneling and trim accessories.
- D. Samples for Verification: For plastic paneling and trim accessories, in manufacturer's standard sizes.

1.5 QUALITY ASSURANCE

- A. Provide panels and accessories by one manufacturer to ensure warranty and color match.
- B. ASTM International:
 1. ASTM D2583 Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor.
 2. ASTM D5319 Standard Specification for Glass-Fiber Reinforced Polyester Wall and Ceiling Panels.
 3. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials.

1.6 SYSTEM DESCRIPTION

- A. Performance Requirements: Provide fiberglass reinforced plastic (FRP) panels which have been manufactured and installed to maintain performance criteria stated by manufacturer without defects, damage or failure.

1.7 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: Provide wall panels and adhesives with the following fire-test-response characteristics as determined by testing identical products applied with identical adhesives to substrates per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
 1. Surface-Burning Characteristics: As follows, Class III per ASTM E 84:
 - a. Flame-Spread Index: 200 or less.
 - b. Smoke-Developed Index: 450 or less

1.8 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials clearly labeled to identify Manufacturer, brand name, quality or grade and fire hazard classification.
- B. Store horizontally in original undamaged packages.
- C. Remove foreign matter from face of panel with soft bristle brush, avoiding abrasive action.

1.9 PROJECT/SITE CONDITIONS

- A. Environmental Requirements: Install materials when temperature and humidity conditions approximate conditions that will exist when building is occupied.
- B. Provide ventilation to disperse fumes during application of adhesive as recommended by adhesive manufacturer.

1.10 EXTRA MATERIALS

- A. Supply two extra sheets of FRP of each type used in clean, marked for Owner's use. Material must be in manufactures package, unopened.
- B. Supply 10% of each type of moldings. Moldings must be packaged in a round tube to be sealed on both ends to protect the moldings from damages. Container must identify the quantity and type of each piece.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide one of the products.
 - 1. Marlite FRP with Sani-Coat Sealer, Marlite, Dover, OH
 - 2. Glasbord-P with Surfaseal, Kemlite Corporation
 - 3. LascoBoard Sta-Clean Class III, Lasco Panel Products, Florence, KY

2.2 MATERIALS

- A. Panels and Accessories: Provide the following:
 - 1. Fiberglass reinforced plastic, 0.09 inches thick, minimum. Product shall meet or exceed the following:

<u>Property</u>	<u>ASTM Test Method</u>	<u>Units</u>
Bearing Strength	D 953	psi 20,000
Flexural Strength	D 790	psi 1.7 x 10 ⁴
Flexural Modulus	D 790	psi 6.0 x 10 ⁶
Tensile Strength	D 638	psi 8.0 x 10 ³

Coefficient of Lineal Thermal Expansion	D 696	in/in°F 1.57×10^{-5}
Water Absorption	D 570	% < 0.5
Thermal Conductivity (K-factor)	C 177	BTU/in/1.2 hr/ft ² /°F
Flame Spread	E 84	- <200
Smoke Developed	E 84	- <450

2. Color/Texture: White panel with smooth finish.
- B. Adhesive: Manufacturer's recommended type for use with selected materials, waterproof, mildew resistant nonstaining type.
- C. Sealant: Latex type as approved by adhesive and wall paneling manufacturer.
- D. Moldings: If not specifically noted elsewhere, use extruded aluminum molding trim pieces. Use at panel divisions, internal and external corners, including end cap molding.
- E. Miscellaneous Items: Furnish and install supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation, whether or not specified or indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions:
 1. Examine substrate and conditions under which the material is to be installed.
 2. Verify that surfaces, when tested with moisture meter, have proper moisture content.
 3. Verify that nails and screws are recessed, with joints and depressions taped, finish and sealed.
 4. Remove contaminants from areas to be covered.
 5. Do not proceed with Work until work of other trades which passes through wall covering has been completed and unsatisfactory conditions have been corrected.
 6. Start of Work indicates acceptance of responsibility for performance and any required remedial Work.

3.2 INSTALLATION

- A. Install panels in accordance with manufacturer's printed instructions using full sheet mastic coverage method with no exposed fasteners or "buttons."
- B. Make joints with 1/8 inch space for expansion and use moldings designed for each condition for the Project.
- C. Bevel edges of panels with block plane to permit proper fit into moldings.
- D. If one end of panel must be nailed, do not nail the other end.

- E. Remove plumbing escutcheons, switchplates, wall plates, and surface-mounted fixtures, and cut wall paneling evenly to fit. Replace items after completion of Work.
- F. Where applicable, install paneling before installation of plumbing, casings, bases, cabinets and other items to be applied over paneling.

3.3 CLEANING

- A. Remove excess adhesive and smudges with soft cloth and mineral spirits, or with product recommended by wall panel manufacturer.

- END OF SECTION -

- SECTION 06 6500 -**SOLID POLYMER FABRICATIONS**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Work described in this section includes counter tops.

1.3 RELATED SECTIONS

- A. Section 01 74 19 "Materials Recycling & Waste Management".
- B. Section 01 81 13 "LEED Certification Requirements".
- C. Section 06 4023 "Interior Architectural Woodwork" for millwork.
- D. Section 07 9200 "Joint Sealants" for caulking perimeter of solid surfacing units to adjacent surfaces to produce a water tight attachment.

1.4 REFERENCES

- A. Applicable Standards: Standards of the following, as referenced herein:
 - 1. American National Standards Institute (ANSI)
- B. American Society for Testing and Materials (ASTM)
 - 1. National Electrical Manufacturers Association (NEMA)
 - 2. Federal Specifications (FS)

1.5 SUBMITTALS

- A. Shop drawings: Indicate dimensions, component sizes, fabrication details, attachment provisions and coordination requirements with adjacent work.
- B. Samples: Submit minimum 2" x 2" (50 mm x 50 mm) samples. Indicate full range of color and pattern variation. Approved samples will be retained as standards for work.

- C. Product data: Indicate product description, fabrication information and compliance with specified performance requirements.
- D. LEED Submittal: See Section 018113 LEED Certification Requirements for the following:
 - 1. MRc4 Recycled Content: Product data for products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content.
 - a. Include cost information for each product having recycled content.
 - 2. MRc5 Regional Materials:
 - a. Sourcing location(s): indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery from the project site.
 - b. Manufacturing location(s): indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
 - c. Product Value: indicate dollar value of product containing regional materials; include materials costs only.
 - d. Product Component(s) Value: Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.
 - 3. EQc4.1 Adhesives & Sealants: Product data for adhesives & sealants, including printed statement of VOC content and chemical components.
 - 4. EQc4.4 Composite Wood & Agri-fiber:
 - a. Provide documentation indicating that product contains no added urea formaldehyde.
 - b. Provide documentation indicating that the bonding agent or adhesive contains no added urea formaldehyde.
- E. Maintenance data: Submit manufacturer's care and maintenance data, including repair and cleaning instructions. Include in project close-out documents.

1.6 QUALITY ASSURANCE

- A. Allowable tolerances:
 - 1. Variation in component size: $\pm 1/8"$ (3 mm).
 - 2. Location of openings: $\pm 1/8"$ (3 mm) from indicated location.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Deliver no components to project site until areas are ready for installation. Store components indoors prior to installation.
- B. Handle materials to prevent damage to finished surfaces. Provide protective coverings to prevent physical damage or staining following installation for duration of project.

1.8 WARRANTY

- A. Provide manufacturer's 10 year warranty against defects in materials. Warranty shall provide material and labor to repair or replace defective materials. Damage caused by physical or chemical abuse or damage from excessive heat will not be warranted.

PART 2 - PRODUCTS**2.1 MANUFACTURES**

- A. Basis for Design: Corian Surface manufactured by E. I. du Pont de Nemours and Company, Wilmington DE (800) 426-7486 Website: www.corian.com
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Avonite, Inc.
 2. E. I. du Pont de Nemours and Company, Corian Surfaces.
 3. Meganite Inc.; a division of the Pyrochem Group.
 4. Technistone USA, Inc..

2.2 SOLID-SURFACING-MATERIAL COUNTERTOPS

- A. Grade: Premium.
- B. Solid-Surfacing-Material Thickness: **1/2 inch (12.7 mm)**.
- C. Colors, Patterns, and Finishes: Provide materials and products that result in colors of solid-surfacing material complying with the following requirements:
1. As selected by Architect from manufacturer's full range.
- D. Fabricate tops in one piece, unless otherwise indicated. Comply with solid-surfacing-material manufacturer's written recommendations for adhesives, sealers, fabrication, and finishing.
1. Fabricate tops with shop-applied edges of materials and configuration indicated.
 2. Fabricate tops with shop-applied backsplashes.
- E. Drill holes in countertops for plumbing fittings and in shop.

2.3 SOLID POLYMER MATERIALS

- A. Solid-Surfacing Material: Homogeneous solid sheets of filled acrylic resin complying with ISSFA-2, meeting ANSI Z124.3 & .6, Type Six, and Fed. Spec. WW-P-541E/GEN.
1. Superficial damage to a depth of 0.010" (.25 mm) shall be repairable by sanding and polishing.
- B. Lavatory tops with seamed bowls; 3/4" (19 mm) thick countertop of solid polymer material, having edge details as indicated on the interior finish drawings. Provide countertops complete with backsplashes of size shown on the interior finish drawings.

C. Performance characteristics:

<u>PROPERTY /TYPICAL RESULT</u>	<u>TEST</u>
1. Tensile Strength /6,000 psi	ASTM D 638
2. Tensile Modulus / 1.5 x 10 ⁶ psi	ASTM D 638
3. Tensile Elongation / 0.4% min.	ASTM D 638
4. Flexural Strength 10,000 psi	ASTM D 790
5. Flexural Modulus 1.2 x 10 ⁶ psi	ASTM D 790
6. Hardness >85 Rockwell "M" Scale	ASTM D 785
7. 56 Barcol Impressor	ASTM D 2583
8. Thermal Expansion 3.02 x 10 ⁻⁵ in./in./°C (1.80 x 10 ⁻⁵ in./in./°F)	ASTM D 696
9. Gloss (60° Gardner) 5–75 (matte—highly polished)	ANSI Z124
10. Light Resistance (Xenon Arc) No effect	NEMA LD 3-2000 Method 3.3
11. Wear and Cleanability Passes	ANSI Z124.3 & Z124.6
12. Stain Resistance: Sheets Passes	ANSI Z124.3 & Z124.6
13. Fungus and Bacteria Resistance Does not support microbial growth	ASTM G 21 & G 22
14. Boiling Water No visible change	NEMA LD 3-2000 Resistance Method 3.5
15. High Temperature No change	NEMA LD 3-2000 Resistance Method 3.6
16. Izod Impact 0.28 ft.-lbs./in. of notch (Notched Specimen) (Method A)	ASTM D 256
17. Ball Impact No fracture—1/2 lb. ball: Resistance: Sheets 1/4" slab—36" drop Method 3.8 1/2"† slab—144" drop	NEMA LD 3-2000
18. Weatherability □E*94<5 in 1,000 hrs.	ASTM G 155
19. Specific Gravity† 1.7	
20. Water Absorption Long-term 0.4% (3/4") 0.6% (1/2"†) 0.8% (1/4")	ASTM D 570
21. Toxicity 99 (solid colors)	Pittsburgh Protocol
22. 66 (patterned colors)	Test ("LC50" Test)
23. Flammability All colors	ASTM E 84,
24. (Class I and Class A) Flame Spread Index <25 Smoke Developed Index <25	NFPA 255 & UL 723
25. TECHNICAL BULLETIN C-1-2004	
26. †Approximate weight per square foot 1/4" (6 mm) 2.2 lbs. • 1/2"† (12.3 mm) 4.4 lbs.	
27. Shapes meet or exceed the ANSI Z124.3 and ANSI Z124.6 standards for plastic sinks and lavatories.	

28. NEMA results based on the NEMA LD 3-2000

2.4 ACCESSORY PRODUCTS

- A. Joint adhesive: Manufacturer's standard two-part adhesive kit to create inconspicuous, non-porous joints, with a chemical bond.

2.5 FABRICATION

- A. For warranty coverage, fabricator/installer shall be approved by solid polymer manufacturer.
- B. Fabricate components in shop to greatest extent practical to sizes and shapes indicated, in accordance with approved shop drawings and solid polymer manufacturer requirements.
- C. Form joints between components using manufacturer's standard joint adhesive. Joints shall be inconspicuous in appearance and without voids. Attach 2" (50 mm) wide reinforcing strip of solid polymer material under each joint.
- D. Provide holes and cutouts for plumbing and bath accessories as indicated on the drawings.
- E. Rout and finish component edges to a smooth, uniform finish. Rout all cutouts, and then sand all edges smooth. Repair or reject defective or inaccurate work.
- F. Finish: All surfaces shall have uniform finish.
 - 1. Matte ,with a gloss rating of 5 - 20

PART 3 - EXECUTION

3.1 JOB MOCK-UP

- A. Prior to final approval of shop drawings, erect one full size mock-up of each component at project site for Owner's Representative review.
- B. Should mock-up not be approved, rework or remake until approval is secured. Remove rejected units from project site.
- C. Approved mock-ups shall remain as part of finished work.

3.2 INSTALLATION

- A. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
 - 1. Align adjacent solid-surfacing-material countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
 - 2. Install countertops with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.

- 3. Calk space between backsplash and wall with sealant specified in Division 07 Section "Joint Sealants."
- B. Form field joints using manufacturer's recommended adhesive, with joints inconspicuous in finished work. Keep components and hands clean when making joints.
- C. Keep components and hands clean during installation. Remove adhesives, sealants and other stains. Components shall be clean on Date of Substantial Completion.
- D. Make plumbing connections to sinks in accordance with Division 15. Mechanical.

3.3 REPAIR & PROTECTION

- A. Protect surfaces from damage until Date of Substantial Completion. Repair or replace damaged work that cannot be repaired to Owner's Representative's satisfaction.
- B. Fabricator/Installer is to provide a commercial care and maintenance video, review maintenance procedures and warranty details with the director of maintenance upon completion of project.

- END OF SECTION -

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- SECTION 07 1326 -

SELF-ADHERING SHEET WATERPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Modified bituminous sheet waterproofing, fabric reinforced.
 - 2. Protection Board.
 - 3. Molded-sheet drainage panels.
 - 4. Prefabricated geocomposite drain.

1.3 RELATED SECTIONS

- A. Section 01 74 19 "Materials Recycling & Waste Management".
- B. Section 01 81 13 "LEED Certification Requirements".
- C. Section 07 9200 "Joint Sealants" for joint-sealant materials and installation.

1.4 SUBMITTALS

- A. General: Submit in accordance with Section 01 3219.
- B. Product Data: Submit product data for materials and accessories.
- C. Submit following Informational Submittals:
 - 1. Certifications specified in Quality Assurance article.
 - 2. Qualification Data: Applicator's qualification data.
 - 3. Manufacturer's instructions; include applicable temperature ranges.
 - 4. Manufacturer's Field Reports: Written results and findings of manufacturer's field services specified as part of Field Quality Control.
- D. LEED Submittal: See Section 018113 LEED Certification Requirements for the following:

1. MRc4 Recycled Content: Product data for products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content.
 - a. Include cost information for each product having recycled content.
 2. MRc5 Regional Materials:
 - a. Sourcing location(s): indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery from the project site.
 - b. Manufacturing location(s): indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
 - c. Product Value: indicate dollar value of product containing regional materials; include materials costs only.
 - d. Product Component(s) Value: Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.
 3. EQc4.1 Adhesives & Sealants: Product data for adhesives & sealants, including printed statement of VOC content and chemical components.
- E. Closeout Submittals:
1. Submit under provisions of Division 01.
 2. Warranty: Submit specified warranty.

1.5 QUALITY ASSURANCE

- A. Manufacturer's Qualifications:
1. Not less than 5 years documented experience in manufacturing of specified waterproofing.
 2. Obtain primary waterproofing materials from single manufacturer. Manufacturer's name shall appear on containers.
 3. Provide secondary materials as required by manufacturer of primary materials.
 4. Manufacturer's qualified technical representative will be required to visit Project site to advise applicator of procedures and precautions for installation of waterproofing materials.
 5. Manufacturer's technical representative will be required to be at Project site weekly during installation and immediately prior to installation of protection board to ensure waterproofing has been properly installed and warranty requirements have been met.
- B. Applicator Qualifications:
1. Acceptable to membrane manufacturer prior to execution of this Contract.
 2. Company specializing in application of specified waterproofing.
 3. Minimum 3 years documented experience with submitted product.
- C. Owner reserves right to hire independent waterproofing consultant to review submittals, procedures, and installation.

SELF-ADHERING SHEET WATERPROOFING

D. Certifications:

1. Submit manufacturer's certification stating materials ordered and supplied are compatible with each other, suited for locale and purpose intended and shipped in sufficient quantity to ensure proper timely installation.
2. Certification shall also state that waterproofing materials have express warranty of fitness for the particular purposes of this Project.
3. Certify materials shipped to Project site meet membrane manufacturer's published performance standards and requirements of this Specification.

1.6 PRE-INSTALLATION CONFERENCE

A. Conduct pre-installation conference in accordance with Division 01.

B. Agenda:

1. Review Project Specifications and Drawings.
2. Establish installation schedules and sequence.
3. Coordinate work with in-place and subsequent construction.
4. Review weather and working conditions.
5. Review installation procedures, including:
 - a. Substrate requirements for Project acceptance (curing of concrete surface, form release agents, temperature).
 - b. Waterproofing installation.
 - c. Phasing and sequencing requirements.
 - d. Termination, flashing, expansion joint, and penetration requirements.
 - e. Review inspection, testing, and quality control procedures.
 - f. Review protection requirements for construction period beyond waterproofing installation.

C. Conduct tour of areas to be waterproofed and report on surface acceptance, possible problem areas, and recommended remedies.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Comply with requirements of Section 01 6000.
- B. Do not double stack membrane pallets.
- C. Keep primer, mastics and adhesives in dry area away from flames, sparks and excessive heat.
- D. Store material in dry area out of direct sunlight.
- E. Cover materials and allow for adequate ventilation.

1.8 PROJECT CONDITIONS

- A. Environmental Requirements:
 - 1. Do not apply products when surface or ambient temperature is below 40 degrees F unless special low temperature products are used.
 - 2. Do not apply products in any instances where surface temperature is lower than 25 degrees F.
 - 3. Do not apply to damp or frozen surfaces or during inclement weather.
- B. Do not work or walk on exposed waterproofing membrane. Install permanent protection board immediately to protect membrane during subsequent work operations.

1.9 SEQUENCING

- A. Coordinate and sequence work to ensure that construction materials placed against or over waterproofing and protection system will occur within 7 days of membrane installation. Do not expose membrane to ultraviolet rays beyond period of time recommended by system manufacturer.
- B. Install protection board within 24 hours of membrane installation.

1.10 WARRANTY

- A. Comply with requirements of Section 01 7700.
- B. Provide custom warranty or standard warranty with attachments for full replacement value of completed installation signed by manufacturer, applicator and Contractor warranting against water infiltration and defects of materials and workmanship for period of 5 years from date of Substantial Completion. If manufacturer will not allow installer and Contractor to sign manufacturer's warranty, append installer and Contractor's warranty to manufacturer's warranty to create warranty that covers labor and workmanship, including labor for access to waterproofing, for watertight warranty.
- C. Warrant penetrations, terminations, sealants, expansion joints, membrane, and protection board.
- D. Warranty shall include removing and reinstalling superimposed work covering waterproofing.
- E. Warranty with disclaimer disallowing implied warranties of merchantability and/or fitness for a particular purpose or other disclaimers that reduce Owner protection is not acceptable. If manufacturer's standard warranty is used and the warranty disclaims implied or expressed warranties of merchantability and fitness, the manufacturer shall remove that disclaimer and have authorized representative initial noting acceptance of warranty responsibility.

PART 2 - PRODUCTS

2.1 MODIFIED BITUMINOUS SHEET WATERPROOFING

- A. Modified Bituminous Sheet: **60-mil- (1.5-mm-)** thick, self-adhering sheet consisting of **56 mils (1.4 mm)** of rubberized asphalt laminated to a **4-mil- (0.10-mm-)** thick, polyethylene film with release liner on adhesive side and formulated for application with primer or surface conditioner that complies with VOC limits of authorities having jurisdiction.
1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Bituthene 4000 Waterproofing System, Grace Construction Products, Cambridge, MA.
 - b. MEL-ROL or MEL-GARD, W. R. Meadows, Inc., Elgin, IL.
 - c. Miradri 860, MiraDRI Moisture Protection, Norcross, GA.
 - d. Polyguard No. 650 Membrane, Polyguard Products, Inc., Ennis, TX.
 2. Sheet Membrane: Self-adhering membrane of rubberized asphalt laminated to polyethylene sheet or heavy-duty protection course.
 - a. Low temperature grade when dictated by temperature at time of application.
 - b. Compatible with water based primer.
 - c. Physical Properties:
 - 1) Tensile Strength: **250 psi (1.7 MPa)** minimum; ASTM D 412, Die C, modified.
 - 2) Ultimate Elongation: 300 percent minimum; ASTM D 412, Die C, modified.
 - 3) Low-Temperature Flexibility: Pass at **minus 20 deg F (minus 29 deg C)**; ASTM D 1970.
 - 4) Crack Cycling: Unaffected after 100 cycles of **1/8-inch (3-mm)** movement; ASTM C 836.
 - 5) Puncture Resistance: **40 lbf (180 N)** minimum; ASTM E 154.
 - 6) Hydrostatic-Head Resistance: **150 feet (45 m)** minimum; ASTM D 5385.
 - 7) Water Absorption: 0.15 percent weight-gain maximum after 48-hour immersion at **70 deg F (21 deg C)**; ASTM D 570.
 - 8) Vapor Permeance: **0.05 perms (2.9 ng/Pa x s x sq. m)**; ASTM E 96, Water Method.

2.2 AUXILIARY MATERIALS

- A. General: Furnish auxiliary materials recommended by waterproofing manufacturer for intended use and compatible with sheet waterproofing.
1. Furnish liquid-type auxiliary materials that comply with VOC limits of authorities having jurisdiction.
- B. Primer/Conditioner: Water-based VOC compliant type required by membrane manufacturer. No solvent or 1,1,1 - Trichloroethane based primers will be accepted.
- C. Liquid Membrane: Two component elastomeric, mastic grade as furnished by membrane manufacturer.

- D. Cement Mortar: Epoxy or latex modified cementitious composition acceptable to membrane manufacturer.
- E. Concrete Patching Compound: Fast setting, non-shrinking patching compound, of type acceptable to membrane manufacturer.
- F. Protection Course: Fan folded, with a core of extruded-polystyrene board insulation faced both sides with plastic film, nominal thickness **1/4 inch (6 mm)**, with compressive strength of not less than **8 psi (55 kPa)** per ASTM D 1621, and maximum water absorption by volume of 0.6 percent per ASTM C 272.
- G. Protection Board Adhesive: Type required by board manufacturer and compatible with membrane.

2.3 MOLDED-SHEET DRAINAGE PANELS

- A. Nonwoven-Geotextile-Faced, Molded-Sheet Drainage Panel for Vertical Applications: Manufactured composite subsurface drainage panels consisting of a nonwoven, needle-punched geotextile facing with an apparent opening size not exceeding **No. 70 (0.21-mm)** sieve laminated to one side with a polymeric film bonded to the other side of a studded, nonbiodegradable, molded-plastic-sheet drainage core, with a vertical flow rate of **16 gpm per ft. (200 L/min. per m)**.
 - 1. Basis-of-Design Product: Grace Construction Products; Hydroduct 220.
- B. Perimeter Drain: Combination low- and high-profile drainage core, geotextile and polymeric film with universal outlet, tee and connector fittings to transport water to drainage exits as recommended by manufacturer of molded sheet drainage panels.
 - 1. Basis-of-Design Product: Grace Construction Products; Hydroduct Coil 600 Perimeter Drain.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions and proceed with work when substrates are ready.
- B. Ensure surfaces are reasonably smooth and free of holes, cracks or projections which might be detrimental to successful installation.
- C. Verify that curing methods used for concrete are compatible with membrane system.
- D. Verify that horizontal surfaces have smooth wood float finish, free from defects. Broom finish not acceptable.
- E. Verify that items penetrating waterproofing system are securely installed.
- F. Verify that concrete surfaces have cured a period of time acceptable to membrane manufacturer.
- G. Verify that masonry joints are struck flush with face of unit.

SELF-ADHERING SHEET WATERPROOFING

3.2 PREPARATION

- A. Protect adjacent surfaces not designated to receive waterproofing.
- B. Clean and prepare surfaces in accordance with manufacturer's instructions.
- C. Seal cracks and joints in accordance with manufacturer's instructions. Use proper depth-width ratio required by sealant manufacturer.
- D. Remove sharp projections, fins, and loose material. Remove form ties to 3/4 inch minimum behind face of wall. Fill holes, voids, and honeycomb areas flush with concrete patching compound or cement mortar.
- E. Seal penetrations through sheet waterproofing to provide watertight seal with detail tape patches or wraps and a liquid-membrane troweling as recommended by membrane manufacturer.
- F. Seal exposed edges of sheets at terminations not concealed by metal counterflashings or ending in reglets with a liquid-membrane troweling as recommended by membrane manufacturer.
- G. Provide fillet or cant at junction of vertical and horizontal surfaces using cast-in-place cement mortar in configuration acceptable to membrane manufacturer.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions and approved shop drawings.
- B. Apply primer/conditioner at rate required by manufacturer. Install only as much primer/conditioner as can be covered in same day.
- C. Prior to placing full membrane, provide membrane strips at inside corners, outside corners, and working joints. Center strips along axis of corner and joint.
- D. Extend membrane over footing and down face 6 inches minimum, except terminate at point 12 inches below floor slab of protected space where footings are at greater depth.
- E. Install membrane in shingle fashion with edges and ends overlapped at dimensions required by manufacturer.
- F. Remove release paper layer. Roll out laps and surface with mechanical roller to encourage full contact bond.
- G. Completely bond membrane to substrate, except those areas directly over or within 3 inches of working cracks or expansion joints.
- H. Seal perimeter ends and edges to adjoining surfaces.
- I. Seal items penetrating membrane with flashing membrane material and liquid membrane. Ensuring positive seal with membrane and penetrating member.

3.4 MOLDED-SHEET DRAINAGE PANEL INSTALLATION

- A. Place and secure molded-sheet drainage panels, with geotextile facing away from wall or deck substrate, according to manufacturer's written instructions. Use adhesives, tapes, or mechanical fasteners that do not penetrate waterproofing. Lap edges and ends of geotextile to maintain continuity. Protect installed molded-sheet drainage panels during subsequent construction.

3.5 FIELD QUALITY CONTROL

- A. Manufacturer's Field Services:
 - 1. Comply with requirements of Section 01 4200.
 - 2. Notify manufacturer prior to start of Work and make arrangements for manufacturer's technical representative to be present during first day's work to verify work is being conducted in accordance with their requirements.
 - 3. Submit summary report; include Project site observations, instructions and monitoring activities.
- B. Flood Tests - Horizontal Surfaces:
 - 1. Before completed surfaces are covered by other work, test for leaks with 2 inch depth of water maintained for 48 hours.
 - 2. Repair leaks revealed by examination of substructure, and repeat test until no leakage is observed.

3.6 PROTECTION AND CLEANING

- A. Protect finished work in accordance with Section 01 7400.
- B. Protect adjacent surfaces from damages and stains. Clean materials from surfaces where inadvertently applied.

- END OF SECTION -

- SECTION 07 2100 -

THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Cavity-wall insulation.
 - 2. Concealed building insulation.
 - 3. Exposed building insulation.
 - 4. Fire safing insulation.
 - 5. Vapor retarders.

1.3 RELATED SECTIONS

- A. Section 01 74 19 "Materials Recycling & Waste Management".
- B. Section 01 8113 "Sustainable Design (LEED) Requirements" for additional LEED requirements.
- C. Section 07 5400 "Thermoplastic Membrane (TPO) Roofing" for insulation specified as part of single ply membrane roofing construction.
- D. Section 07 8413 "Penetration Firestopping" for sealing penetrations through fire rated assemblies.
- E. Section 07 8446 "Fire-Resistive Joint Systems" for insulation installed as part of a perimeter fire-resistive joint system.
- F. Section 09 8100 "Acoustical Insulation" for sound attenuation blankets within interior partitions.
- G. Division 23 Section "Mechanical Insulation."

1.4 REFERENCES

- A. ASTM C165 - Test Method for Measuring Compressive Properties of Thermal Insulations.

- B. ASTM C411 - Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
- C. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2001.
- D. ASTM C764 - Specification for Mineral Fiber Loose-Fill Thermal Insulation.
- E. ASTM C1104 - Test Method for Determining the Water Vapor Sorption of Unfaced Mineral Fiber Insulation.
- F. STM C1304 - Standard Test Method for Assessing the Odor Emission of Thermal Insulation Materials.
- G. ASTM C1320 - Standard Practice for Installation of Mineral Fiber Batt and Blanket Thermal Insulation.
- H. ASTM C1338 - Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings.
- I. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2001.
- J. ASTM E96 - Test Methods for Water Vapor Transmission of Materials.
- K. ASTM E119, - Test Methods for Fire Tests of Building Construction and Materials.

1.5 DEFINITIONS

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

1.6 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. LEED Submittal:
 - 1. Product Data for Credit MR 4.1 and MR 4.2: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
 - a. Include statement indicating costs for each product having recycled content.
- C. LEED Submittal: See Section 018113 LEED Certification Requirements for the following:
 - 1. EQc4.1 Adhesives & Sealants: Product data for adhesives & sealants, including printed statement of VOC content and chemical components.
 - 2. EQc4.4 Composite Wood & Agri-fiber:
 - a. Provide documentation indicating that product contains no added urea formaldehyde.
 - b. Provide documentation indicating that the bonding agent or adhesive contains no added urea formaldehyde.

THERMAL INSULATION

- D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency for insulation products.

1.7 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of building insulation through one source from a single manufacturer.
- B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
 - 1. Surface-Burning Characteristics: ASTM E 84.
 - 2. Fire-Resistance Ratings: ASTM E 119.
 - 3. Combustion Characteristics: ASTM E 136.

1.8 DELIVERY, STORAGE, AND HANDLING

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

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

2.2 FORMALDEHYDE-FREE INSULATING MATERIALS

- A. Manufacturers:
 - 1. CertainTeed Corporation.
 - 2. Dow Chemical
 - 3. Guardian Fiberglass, Inc.

4. Johns Manville.
 5. Knauf Fiber Glass.
 6. Owens Corning.
- B. Green Guard Certified or formaldehyde-free Unfaced Glass-Fiber Batt Insulation: Unfaced Batts; ASTM C665, Type I (blankets without membrane facing); with maximum flame-spread and smoke-developed indices of 25 and 50, respectively; and of the following properties:
1. Combustion Characteristics: Passes ASTM E136.
 2. Critical Radiant Flux: ASTM E970, greater than 0.11 Btu/sq ft s (0.12 W/cm sq).
 3. Water Vapor Sorption: ASTM C1104, 5 percent or less.
 4. Odor Emission: Passes ASTM C1304.
 5. Corrosiveness: Passes ASTM C665.
 6. Fungi Resistance: Passes ASTM C1338.
 7. Recycled Content: Certified by Scientific Certification Systems to contain minimum of 18 percent post-consumer and seven (7) percent pre-consumer recycled glass product, on average of manufacturer's products.
- C. Green Guard Certified or formaldehyde-free FSK-25 Faced Glass-Fiber Batt Insulation: JM Formaldehyde-Free FSK-25 Faced Batts; ASTM C665, Type III, Class A, Category 1 with maximum flame-spread and smoke-developed indices of 25 and 50, respectively; and of the following properties:
1. Combustion Characteristics: Passes ASTM E136.
 2. Critical Radiant Flux: ASTM E970, greater than 0.11 Btu/sq ft s (0.12 W/cm sq).
 3. Water Vapor Permeance: ASTM E96, 0.05 Perms (3 ng/Pa-s m2).
 4. Water Vapor Sorption: ASTM C1104, 5 percent or less.
 5. Odor Emission: Passes ASTM C1304.
 6. Corrosiveness: Passes ASTM C665, 13.8.
 7. Fungi Resistance: Passes ASTM C1338.
 8. Recycled Content: Certified by Scientific Certification Systems to contain minimum of 18 percent post-consumer and seven (7) percent pre-consumer recycled glass product, on average of manufacturer's products

2.3 GLASS-FIBER BLANKET INSULATION

- A. Where glass-fiber blanket insulation is indicated by the following thicknesses, provide blankets in batt or roll form with thermal resistances indicated:
1. 3-1/2 inches (89 mm) thick with a thermal resistance of 11 deg F x h x sq. ft./Btu at 75 deg F (1.9 K x sq. m/W at 24 deg C).
 2. 3-5/8 inches (92 mm) thick with a thermal resistance of 11 deg F x h x sq. ft./Btu at 75 deg F (1.9 K x sq. m/W at 24 deg C).
 3. 5-1/2 inches (140 mm) thick with a thermal resistance of 21 deg F x h x sq. ft./Btu at 75 deg F (3.7 K x sq. m/W at 24 deg C).
 4. 6-1/2 inches (165 mm) thick with a thermal resistance of 19 deg F x h x sq. ft./Btu at 75 deg F (3.3 K x sq. m/W at 24 deg C).

THERMAL INSULATION

2.4 VAPOR RETARDER

- A. Polyethylene Vapor Retarder: ASTM D 4397, 6 mils (0.15 mm) thick, with maximum permeance rating of 0.13 perm (7.5 ng/Pa x s x sq. m).
- B. Reinforced-Polyethylene Vapor Retarder: 2 outer layers of polyethylene film laminated to an inner reinforcing layer consisting of either nylon cord or polyester scrim and weighing not less than 25 lb/1000 sq. ft. (12 kg/100 sq. m), with maximum permeance rating of 0.0507 perm (2.9 ng/Pa x s x sq. m).
 - 1. Available Products:
 - a. Raven Industries Inc.; DURA-SKRIM 6WW.
 - b. Reef Industries, Inc.; Griffolyn T-65.
- C. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.
- D. Vapor-Retarder Fasteners: Pancake-head, self-tapping steel drill screws; with fender washers.
- E. Single-Component Nonsag Urethane Sealant: ASTM C 920, Type I, Grade NS, Class 25, Use NT related to exposure, and Use O related to vapor-barrier-related substrates.

2.5 INSULATING MATERIALS

- A. General: Provide insulating materials that comply with requirements and with referenced standards.
 - 1. Preformed Units: Sizes to fit applications indicated, selected from manufacturer's standard thicknesses, widths, and lengths.
- B. Unfaced Mineral-Fiber Blanket Insulation: Thermal insulation combining mineral fibers of type described below with thermosetting resins to comply with ASTM C 665, Type I (blankets without membrane facing).
 - 1. Mineral Fiber Type: Fibers manufactured from glass.
 - 2. Surface Burning Characteristics: Maximum flame-spread and smoke-developed index of 20.
- C. Faced Mineral Fiber Blanket/Batt Insulation: Thermal insulation produced by combining mineral fibers of type described below with thermosetting resins to comply with ASTM C 665 for Type III, Class A (blankets with reflective vapor-retarder membrane facing with flame spread of 25 or less); foil-scrim-Kraft (FSK) membrane on one face, and as follows:
 - 1. Mineral Fiber Type: Fibers manufactured from glass.
 - 2. Surface Burning Characteristics: Maximum flame spread and smoke developed values of 25 and 50, respectively.
- D. Foil-Faced, Glass-Fiber Blanket Insulation: ASTM C 665, Type III (reflective faced), Class B (faced surface with a flame-propagation resistance of 0.12 W/sq. cm); Category 1 (membrane is a vapor barrier), faced with foil scrim, foil-scrim kraft, or foil-scrim polyethylene.
- E. Kraft-Faced, Glass-Fiber Blanket Insulation: ASTM C 665, Type II (non-reflective faced), Class C (faced surface not rated for flame propagation); Category 1 (membrane is a vapor barrier).

- F. Unfaced, Glass-Fiber Board Insulation: Thermal insulation combining glass fibers with thermosetting resin binders to comply with ASTM C 612, Type IA and IB; and with other requirements indicated below:
 - 1. Nominal density of 3 lb/cu. ft., thermal resistivity of 4.3 deg F x h x Sq. Ft./Btu x in. at 75 deg F.
 - 2. Thickness: 2 inches unless shown otherwise (R-8.7).

2.6 SAFING INSULATION AND ACCESSORIES

- A. Safing insulation shall be USG Thermafiber mineral fiber safing insulation, unfaced. Insulation shall comply with ASTM C665, Type I; ASTM C612, Classes 1 and 2; and have nominal 4.0 pcf density.
- B. Sealant shall be as approved by manufacturer of safing insulation for conditions shown.

2.7 AUXILIARY INSULATING MATERIALS

- A. Wire and Insulation Supports: As manufactured by E-Z Wire Products or as recommended by insulation manufacturer.
- B. Adhesively Attached Pin Anchors: Perforated plate, 2 inches square, welded to projecting pin, with self-locking washer, complying with the following requirements:
 - 1. Plate: Zinc-plated steel, 0.106 inch thick.
 - 2. Pin: Copper-coated low carbon steel, fully annealed, 0.106 inches in diameter, length to suit depth of insulation indicated and, with washer in place, to hold insulation tightly to substrate behind insulation.
 - 3. Self-Locking Washer: Mild steel, 0.016 inch thick, size as required to hold insulation securely.
 - a. Where spindles will be exposed to human contact after installation, protect ends with capped self-locking washers.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions with Installer present, for compliance with requirements of the Sections in which substrates and related work are specified and to determine if other conditions affecting performance of insulation are satisfactory. Do not proceed with installation of insulation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of substances harmful to insulations or vapor retarders, including removal of projections that might puncture vapor retarders.

3.3 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's instructions applicable to products and application indicated. If printed instructions are not available or do not apply to project conditions, consult manufacturer's technical representative for specific recommendations before proceeding with installation of insulation.
- B. Extend insulation full thickness as indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions, and fill voids with insulation. Remove projections that interfere with placement.
- C. Apply a single layer of insulation of required thickness, unless otherwise shown or required to make up total thickness.

3.4 INSTALLATION OF GENERAL BUILDING INSULATION

- A. Apply insulation units to substrate by method indicated, complying with manufacturer's written recommendations. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units. Place insulation at exterior wall construction, and where shown on Drawings in manner to insure continuous thermal barrier.
- B. Install unfaced batts in wall framing where shown. Friction fit.
 - 1. Install batts above termination of gypsum wallboard utilizing 18 gauge wire perpendicular to the batt at 18 inches on center, or attach pin anchor at intervals required by insulation manufacturer.
- C. Set reflective, foil-faced units accurately with not less than 0.75-inch air space in front of foil. Set foil face to warm side of construction unless shown otherwise.
 - 1. Insulation in attic at plenum spaces, which are exposed to view, shall be Type III foil-scrim-Kraft faced.

3.5 INSTALLATION OF VAPOR RETARDER

- A. General: Extend vapor retarder to extremities of areas to be protected from vapor transmission. Secure in place with adhesives or other anchorage system as indicated. Extend vapor retarder to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.
- B. Before installing vapor retarder, apply urethane sealant to flanges of metal framing including runner tracks, metal studs, and framing around door and window openings. Seal overlapping joints in vapor retarder with vapor-retarder tape according to vapor-retarder manufacturer's written instructions. Seal butt joints with vapor-retarder tape. Locate all joints over framing members or other solid substrates.
- C. Firmly attach vapor retarder to metal framing and solid substrates with vapor-retarder fasteners as recommended by vapor-retarder manufacturer.
- D. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarder with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarder.

- E. Repair tears or punctures in vapor retarder immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarder.

3.6 INSTALLATION OF SAFING INSULATION

- A. Install safing insulation to fill gap between top of partition and horizontal material above, or as otherwise shown on Drawings. Apply sealant to complete safing assembly, as shown in Gypsum Association Fire Resistance Design Manual (15th Edition), Section II (Requirements for Fire Protection).

3.7 PROTECTION

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

3.8 SCHEDULE

- A. Faced batt insulation at all exterior walls, (R-19) as detailed.
- B. Unfaced batt insulation (R-19) at exterior framed or suspended soffits.
- C. Unfaced batt insulation (R-13) between conditioned and non-conditioned interior spaces.
- D. Unfaced batt insulation (R-19) installed behind plaster unless noted otherwise on Drawings.
- E. Unfaced batt insulation (R-19) installed behind metal panels unless noted otherwise on Drawings.
- F. Kraft paper faced batt insulation (R-19) installed behind glass facade panels unless noted otherwise on Drawings.
- G. Foil Faced batt insulation (R-19) installed at plenums behind glass facade panels (Where Dens Glass will not be covering the insulation) unless noted otherwise on Drawings.

3.9 PROTECTION AND CLEANING

- A. Protect adjacent surfaces, landscaping and property from spillage, overspray, or drift.
- B. Clean spillage, overspray, or drift from adjacent surfaces; remove immediately in accordance with manufacturer's instructions.

- END OF SECTION -

- SECTION 07 2600 -

UNDER-SLAB VAPOR BARRIER

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Under slab vapor barrier membranes
 - 2. Seam tape and mastic.
 - 3. Pipe boots
 - 4. Course and fine granular fill.

1.3 RELATED SECTIONS

- A. Section 01 74 19 "Materials Recycling & Waste Management".
- B. Section 01 81 13 "LEED Certification Requirements".
- C. Section 02 3100 "Subsurface Investigation" and Appendix 'A' for Geotechnical Report and installation recommendations.
- D. Section 03 3000 "Cast-in-Place Concrete" for coordination of vapor barrier installation during base preparation for slab on grade installations.

1.4 DEFINITIONS

- A. Perm: 1 grain/h•ft²•in-Hg.

1.5 SUBMITTALS

- A. General: Submit following items in accordance with Section 01 3219.
- B. Product Data: Submit product data for each product, including penetration accessories and tape.

- C. LEED Submittal: See Section 018113 LEED Certification Requirements for the following:
 - 1. MRc4 Recycled Content: Product data for products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content.
 - a. Include cost information for each product having recycled content.
 - 2. MRc5 Regional Materials:
 - a. Sourcing location(s): indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery from the project site.
 - b. Manufacturing location(s): indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
 - c. Product Value: indicate dollar value of product containing regional materials; include materials costs only.
 - d. Product Component(s) Value: Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.
 - 3. EQc4.1 Adhesives & Sealants: Product data for adhesives & sealants, including printed statement of VOC content and chemical components.

1.6 SEQUENCING

- A. Begin installation only after substrate work is complete and penetrations are securely anchored.
- B. Coordinate with work as specified in Section 03 3000 "Cast-in-Place Concrete".

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design: The design based on Stego Wrap 15Mil Vapor Barrier by Stego Industries LLC. San Juan Capistrano, CA. tel (877) 464-7834 or 949.493.5460, www.stegoindustries.com.
 - 1. Subject to compliance with requirements, provide the named product or a comparable product by one of the following manufactures:
 - a. Stego Wrap 15Mil Vapor Barrier; Stego Industries LLC.
 - b. Premoulded Membrane with Plasmatic Core; W.R. Meadows.
 - c. Zero-Perm; Alumiseal

2.2 MATERIALS

- A. Vapor Barrier: Minimum 15-mil thick polyolefin geotextile membrane, manufactured with prime, virgin resins with the following properties.

Water Vapor Barrier	Class A (Plastics)	ASTM E1745
Water Vapor Transmission Rate:	> 0.006 gr./ft ² /hr.	ASTM E 96
Permeance Rating	≥ 0.01 perms	ASTM E 96

UNDER-SLAB VAPOR BARRIER

Puncture Resistance	2200 grams, min	ASTM D 1709
Minimum Tensile Strength	50.0 lbf./in	ASTM D 882

- B. Joint Tape: Manufacturer's recommended, pressure sensitive type, self adhering, and of perm rating not less than vapor retarder.
1. Minimum 15-mils thick by minimum 4 inches wide
 2. Water Vapor Transmission Rate; 0.01 perms or lower, ASTM E 96.
- C. Adhesive: Type recommended by manufacturer of sheet products, non-sagging grade, compatible with sheet and substrate. Water Vapor Transmission Rate shall be 0.3 perms or lower per ASTM E 96.
- D. Pipe Boots: Construct pipe boots from vapor barrier material, pressure sensitive tape, and mastic per manufactures instructions.
- E. Vapor Proofing Mastic: Type recommended by manufacturer, non-sagging grade, compatible with sheet and substrate. Water Vapor Transmission Rate shall be 0.01 perms or lower per ASTM E 96.
- F. Granular Fill: Clean mixture of crushed stone or crushed or uncrushed gravel; ASTM D 448, Size 57, with 100 percent passing a 1-1/2-inch (37.5-mm) sieve and 0 to 5 percent passing a No. 8 (2.36-mm) sieve.
- G. Fine-Graded Granular Material: Clean mixture of crushed stone, crushed gravel, and manufactured or natural sand; ASTM D 448, Size 10, with 100 percent passing a 3/8-inch (9.5-mm) sieve, 10 to 30 percent passing a No. 100 (0.15-mm) sieve, and at least 5 percent passing No. 200 (0.075-mm) sieve; complying with deleterious substance limits of ASTM C 33 for fine aggregates.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions and proceed with Work when substrates are ready.
- B. Verify that substrate work is complete, clean, dry and installed in accordance with contract documents before beginning installation of sheet products.
- C. Level and tamp or roll aggregate, sand or tamped earth base

3.2 INSTALLATION

- A. Under Slab-on-Grade: Installation shall be in accordance with manufacturer's instructions and ASTM E 1643-98.
 1. Unroll Vapor Barrier with the longest dimension parallel with the direction of the pour.

2. No penetration of the Vapor Barrier is allowed except for reinforcing steel and permanent utilities.
 - a. Seal all penetrations (including pipes) with pre-manufactured boots per manufacturer's instructions.
3. Lay-out sheets to minimize quantity of joints. Lap edge 6 inches minimum and end joints 12 inches minimum and continuously seal with joint tape.
4. Terminate barrier per manufactures recommendations along perimeter; at footers, vertical walls, and against penetrations. Seal perimeter with continuous mastic bead along foundation walls. Seal barrier joints with tape.
5. Refer to Section 03 3000 "Cast-in-Place Concrete" for installation coordination requirements.
6. Repair damaged areas by cutting patches of Vapor Barrier/Retarder, overlapping damaged area 6 inches and taping all four sides with tape.

3.3 PROTECTION

- A. Protect sheets from puncture during installation. Patch punctures before proceeding with subsequent construction.
 - a. NOTE: SCREEDING STAKES DRIVEN THROUGH BARRIER must be repaired per manufactures recommendation.
- B. Install runway planks in construction traffic lanes until slabs are poured.

3.4 FIELD QUALITY CONTROL

- A. Conduct a visual inspection, in the presence of the Architect/Engineer, of the entire barrier installation the day before pouring concrete. Make all corrections prior to pouring any concrete.

3.5 SCHEDULE

- A. Install beneath slab-on-grade throughout the building.

- END OF SECTION -

- SECTION 07 2713 -

**SELF-ADHERED SHEET MEMBRANE AIR
BARRIER, VAPOR IMPERMEABLE**

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. The work of this section includes, but is not limited to, the following:
 - 1. Materials and installation methods for fluid applied air and vapor barrier membrane system located in the non-accessible part of the wall.
 - 2. Materials and installation methods to bridge and seal air leakage pathways in roof and foundation junctions, window and door openings, control and expansion joints, masonry ties, piping and other penetrations through the wall assembly.

1.3 RELATED SECTIONS

- A. Section 06 1600 "Sheathing" for exterior sheathing.
- B. Section 07 4219 "Metal Plate Wall Panels" for metal wall panels.
- C. Section 07 2726 "Vapor Permeable Air Barrier".
- D. Section 07 6200 "Sheet Metal Flashing and Trim" for sheet metal flashings.
- E. Section 07 9200 "Joint Sealants" for joint-sealant materials and installation.

1.4 PERFORMANCE REQUIREMENTS

- A. Provide an air and vapor barrier system to perform as a continuous barrier to air infiltration/exfiltration and water vapor transmission and to act as a liquid water drainage plane flashed to discharge any incidental condensation or water penetration.

1.5 REFERENCES

- A. The following standards and publications are applicable to the extent referenced in the text. The most recent version of these standards is implied unless otherwise stated.
- B. American Society for Testing and Materials (ASTM)
 - 1. E96 Test Methods for Water Vapor Transmission of Materials
 - 2. D570 Test Method for Water Absorption of Plastics
 - 3. E154 Test Method for Water Vapor Retarders used in contact with Earth Under Concrete Slabs, on Walls or as Ground Cover
 - 4. D1004 Test Method for Initial Tear Resistance of Plastic Film and Sheeting
 - 5. D1938 Test Method for Tear Propagation Resistance of Plastic Film and Thin Sheeting by a Single-Tear Method
 - 6. D1876 Test Method for Peel Resistance of Adhesives
 - 7. D1970 Standard Specifications for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection
 - 8. D412 Test Methods for Vulcanized Rubber & Thermoplastic Rubbers and Thermoplastic Elastomers – Tension
 - 9. E2178 Standard Test Method for Air Permeance of Building Materials
 - 10. E2357 Standard Test Method for Determining Air Leakage of Air Barrier Assemblies

1.6 SUBMITTALS

- A. Product Data: Submit manufacturer's product data, installation instructions, use limitations and substrate preparation recommendations.
- B. Shop drawings showing locations and extent of air and vapor barrier system including details for terminations flashings, penetrations, window and door openings and treatment of substrate joints and cracks.
- C. Written documentation demonstrating installers qualifications under the "Quality Assurance" article including reference projects of a similar scope.
- D. Samples: Submit representative samples of the following for approval:
 - 1. Self-Adhered Air Barrier Membrane
 - 2. Self-Adhered Transition Membrane
 - 3. Self-Adhered Through Wall Flashing
- E. Warranty: Submit a sample warranty identifying the terms and conditions.

1.7 QUALITY ASSURANCE

- A. Manufacturer: Air and vapor barrier systems shall be manufactured and marketed by a firm with a minimum of 20 years experience in the production and sales of waterproofing and air barrier products. Manufacturers proposed for use, but not named in these specifications shall submit evidence of ability to meet all requirements specified, and include a list of projects of similar design and complexity completed within the past five years.

- B. Installer: The installer shall demonstrate qualifications to perform the work of this Section by submitting the following:
- C. List of at least three (3) projects contracted within the past five (5) years of similar scope and complexity to this project carried out by the firm and site supervisor.
- D. Installer must show evidence of adequate equipment and trained field personnel to successfully complete the project in a timely manner.
- E. Materials: Self-adhered air and vapor barrier material shall be 40 mil (.004 in) comprising 36 mil (.0036 in.) rubberized asphalt integrally bonded to 4 mil (.0004 in.) cross-laminated polyethylene film. For each type of material required for the work of this section, provide primary materials that are the products of one manufacturer.
- F. Pre-Installation Conference: A pre-installation conference shall be held prior to commencement of field operations to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work. Agenda for meeting shall include but not be limited to the following:
 1. Review of submittals.
 2. Review of surface preparation, minimum curing period and installation procedures.
 3. Review of special details and flashings.
 4. Sequence of construction, responsibilities and schedule for subsequent operations.
 5. Review of mock-up requirements.
 6. Review of inspection, testing, protection and repair procedures.
- G. Mock-up:
 1. Prior to installation of the air and vapor barrier system a field-constructed mock-up shall be provided under the provisions of Section [01340 – Shop Drawings, Product Data, Samples and Mock-ups] to verify details and tie-ins and to demonstrate the required quality of materials and installation.
 2. Construct a typical exterior wall section, 8 feet long and 8 feet wide, incorporating back-up wall, cladding, window and doorframe and sill, insulation, flashing and any other critical junction (roof, foundation, etc).
 3. Allow 24 hours for inspection and testing of mock-up before proceeding with air and vapor barrier work.
 4. Mock-up may remain as part of the work.
- H. Inspection and Testing: Cooperate and coordinate with the Owner's inspection and testing agency. Do not cover any installed air and vapor barrier membrane until it has been inspected, tested and approved.

1.8 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials and products in labeled packages. Store and handle in strict compliance with manufacturer's instructions, recommendations and material safety data sheets. Protect from damage from sunlight, weather, excessive temperatures and construction operations. Remove damaged material from the site and dispose of in accordance with applicable regulations.
- B. Do not double-stack pallets of fluid applied membrane components on the job site. Provide cover on top and all sides, allowing for adequate ventilation.

- C. Protect fluid-applied membrane components from freezing and extreme heat.
- D. Sequence deliveries to avoid delays, but minimize on-site storage.

1.9 PROJECT CONDITIONS

- A. Perform work only when existing and forecasted weather conditions are within the limits established by the manufacturer of the materials used. Proceed with installation only when the substrate construction and preparation work is complete and in condition to receive the air and vapor barrier membrane.

1.10 WARRANTY

- A. Submit manufacturer's warranty that air and vapor barrier and accessories are free of defects at time of delivery and are manufactured to meet manufacturer's published physical properties and material specifications.

PART 2 - PRODUCTS

2.1 GENERAL

- A. For each type of material required for the work of this section, provide primary materials that are the products of one manufacturer.

2.2 SELF-ADHERED AIR BARRIER MEMBRANE

- A. Description: Min. 1 mm (.040 in) thick membrane comprised of 0.9 mm (0.036 in) of self-adhesive rubberized asphalt integrally bonded to 0.1 mm (.004 in) of cross-laminated, high-density polyethylene film. Membrane shall be interleaved with disposable silicone-coated release paper until installed.
- B. Performance Requirements:

Property	Test Method	Typical Value
Thickness	ASTM D 3767 Method A	1.0 mm (0.040 in.) nominal
Air Permeance at 75Pa (0.3 in. water) Differential Pressure	ASTM E 2178	<0.001 L/(s.m ²) (<0.0002 cfm/ft ²)
Assembly Air Permeance at 75Pa (0.3 in. water) Differential Pressure	ASTM E 2357	<0.004 L/s*m ² (<0.0008 cfm/ft ²)
Water Vapor Permeance	ASTM E 96, Method B	Less than 2.9 ng/Pa.s.m ² (0.05 perms)
Water Absorption: -	ASTM D 570	Max. 0.1% by weight
Puncture Resistance	ASTM E 154	178 N (40 lbs.)

SELF-ADHERED SHEET MEMBRANE AIR BARRIER, VAPOR IMPERMEABLE

Tear Resistance	Initiation - ASTM D 1004 Propagation - ASTM D1938	Min. 58 N (7.0 lbs.) M.D. Min. 40 N (4.0 lbs.) M.D.
Lap Adhesion at -4°C (25°F)	ASTM D 1876	880 N/m (5.0 lbs./in.) of width
Low Temperature Flexibility	ASTM D 1970	Unaffected to -43°C (-45°F)
Tensile Strength	ASTM D 412, Die C Modified	Min. 2.7 MPa (400 psi)
Elongation, Ultimate Failure of Rubberized Asphalt	ASTM D 412 - Die C	Min. 200%

C. Materials:

1. Perm-A-Barrier® Wall Membrane from Grace Construction Products, 62 Whittemore Avenue, Cambridge, MA.

2.3 TRANSITION MEMBRANE

- A. Description: Min. 1 mm (.040 in) thick membrane comprised of 0.9 mm (0.036 in) of self-adhesive rubberized asphalt integrally bonded to 0.1 mm (.004 in) of cross-laminated, high-density polyethylene film. Membrane shall be interleaved with disposable silicone-coated release paper until installed.

B. Performance Requirements:

1. Water Vapor Transmission: ASTM E 96, Method B: 2.9 ng/m²sPa (0.05 perms) max.
2. Air Permeance at 75Pa (0.3 in. water) pressure difference: 0.0006 L/(s.m²) (0.00012 cfm/ft²) max.
3. Puncture Resistance: ASTM E 154: 178 N (40 lbs.) min.
4. Lap Adhesion at -4°C (25°F), ASTM D 1876: 880 N/m (5.0 lbs./in.) of width min.
5. Low Temperature Flexibility, ASTM D 1970: Unaffected to -43°C (-45°F).
6. Tensile Strength, ASTM D 412, Die C Modified: min. 2.7 MPa (400 psi)
7. Elongation, Ultimate Failure of Rubberized Asphalt, ASTM D 412 Die C: min. 200%

C. Materials:

1. Perm-A-Barrier Detail Membrane manufactured by Grace Construction Products.

2.4 FLEXIBLE MEMBRANE WALL FLASHING

- A. Description: Min. 1 mm (.040 in) thick membrane comprised of 0.8 mm (0.032 in) of self-adhesive rubberized asphalt integrally bonded to 0.2 mm (.008 in) of cross-laminated, high-density polyethylene film. Membrane shall be interleaved with disposable silicone-coated release paper until installed.
- B. Performance Requirements:
- | | |
|--|---|
| 1. Water Vapor Transmission, ASTM E 96, Method B: | 2.9 ng/m ² sPa (0.05 perms) max. |
| 2. Water Absorption, ASTM D 570: | max. 0.1% by weight |
| 3. Puncture Resistance, ASTM E 154: | 356 N (80 lbs.) min. |
| 4. Tear Resistance | |
| a. Initiation ASTM D 1004: | min. 58 N (13.0 lbs.) M.D. |
| b. Propagation ASTM D 1938: | min. 40 N (9.0 lbs.) M.D. |
| 5. Lap Adhesion at -4°C (25°F), ASTM D 1876: | 880 N/m (5.0 lbs./in.) of width |
| 6. Low Temperature Flexibility, ASTM D 1970: | Unaffected to -43°C (-45°F) |
| 7. Tensile Strength, ASTM D 412, Die C Modified: | min. 5.5 MPa (800 psi) |
| 8. Elongation, Ultimate Failure of Rubberized Asphalt, ASTM D412, Die C: | min. 200% |
- C. Materials:
1. Perm-A-Barrier Wall Flashing manufactured by Grace Construction Products.

2.5 AIR & VAPOR BARRIER ACCESSORIES

- A. Primer: Water-based primer which imparts an aggressive, high tack finish on the treated substrate
1. Flash Point: No flash to boiling point
 2. Solvent Type: Water
 3. VOC Content: Not to exceed 10 g/l
 4. Application Temperature: -4 °C (25 °F) and above
 5. Freezing point (as packaged): -7 °C (21 °F)
 6. Product: Perm-A-Barrier WB Primer manufactured by Grace Construction Products.
- B. Sealant: Two-part, elastomeric, trowel grade material designed for use with self-adhered membranes and tapes. 10 g/l max. VOC Content.
1. Product: Bituthene[®] Liquid Membrane manufactured by Grace Construction Products.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. The installer shall examine conditions of substrates and other conditions under which this work is to be performed and notify the contractor, in writing, of circumstances detrimental to the proper completion of the work. Do not proceed with work until unsatisfactory conditions are corrected.

3.2 PREPARATION

- A. Refer to manufacturer's literature for requirements for preparation of substrates. Surfaces shall be 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 that are acceptable to manufacturer of the fluid-applied waterproofing.
- B. Exterior sheathing panels: Ensure that the boards are sufficiently stabilized with corners and edges fastened with appropriate screws in accordance with exterior sheathing manufactures written instructions.
- C. Masonry Substrates: Apply air and vapor barrier over concrete block and brick with smooth and flush mortar joints. Fill all voids and holes, particularly in the mortar joints, with a lean mortar mix, non-shrinking grout or parge coat.
- D. Related Materials: Treat construction joints and install flashing as recommended by air barrier manufacturer.

3.3 INSTALLATION

- A. Refer to manufacturer's literature for recommendations on installation
- B. Apply air barrier membrane to achieve a continuous air barrier according to air barrier manufacturer's written instructions.
- C. Any Perm-A-Barrier Wall Membrane adjacent to WrapShield needs to be taped off at termination points so that WrapShield is completely isolated from the rubberized asphalt-based adhesive of Perm-A-Barrier backing. The 2 inch VaproTape Single-Sided or 4 inch VaproTape UV Black will be used to tape off edge of Perm-A-Barrier. Refer to Section 07 2726 "Vapor Permeable Air Barrier".
- D. Application of Self-Adhered Air Barrier Membrane
 1. Install air & vapor barrier to dry surfaces at air and surface temperatures of -4°C (25°F) and above in accordance with manufacturer's recommendations, at locations indicated on Construction Documents.
 2. Prime substrate to receive air barrier membrane as required per manufacturers written instructions.
 3. Precut pieces of air & vapor barrier into easily handled lengths.
 4. Remove silicone-coated release paper and position membrane carefully before placing length horizontally against the surface.
 5. Begin installation at the base of the wall placing top edge of membrane immediately below any masonry reinforcement or ties protruding from substrate.
 6. When properly positioned, place against surface by pressing firmly into place. Roll membrane with extension-handled countertop roller immediately after placement.
 7. Overlap horizontally adjacent pieces 50 mm (2 in.) and roll seams.
 8. Seal all non-factory laps with liquid membrane.

9. Subsequent sheets of membrane applied above shall be positioned 3 inches below masonry reinforcement or ties. Bottom edge shall be slit to fit around reinforcing wires or ties, and membrane shall overlap the membrane sheet below by 50 mm (2 in.). Roll firmly into place.
10. Seal around masonry reinforcing or ties and all penetrations with liquid membrane.
11. Continue the membrane into all openings in the wall, such as doors, windows, etc., and terminate at points that will prevent visibility from interior.
12. Coordinate the installation of air & vapor barrier with roof installer to ensure continuity of membrane with rooftop air & vapor membrane.
13. At end of each working day seal top edge of air & vapor barrier to substrate with liquid membrane.
14. Do not allow the rubberized asphalt surface of the air & vapor barrier membrane to come in contact with polysulfide sealants, creosote, uncured coal tar products or EPDM.
15. Do not expose air & vapor barrier membrane to sunlight for more than thirty days prior to enclosure.
16. Inspect installation prior to enclosing and repair punctures, damaged areas and inadequately lapped seams with a patch of the membrane sized to extend 150 mm (6 in.) in all directions from the perimeter of the affected area.

E. Application of Transition Membrane

1. Prime substrate to receive transition membrane as required per manufacturers written instructions.
2. Apply transition membrane with a minimum overlap of 76 mm (3 in.) onto each surface at all beams, columns and joints as indicated in detail drawings.
3. Tie in to window and door frames, spandrel panels, roof and floor intersections and changes in substrate.
4. Use pre-cut, easily handled lengths for each location.
5. Remove silicone-coated release paper and position membrane flashing carefully before placing it against the surface.
6. When properly positioned, place against surface by pressing firmly into place by hand roller.
7. Overlap adjacent pieces 76 mm (3 in.) and roll all seams with a hand roller.
8. Seal all non-factory cuts with liquid membrane.
9. Seal top edge of flashing with liquid membrane.
10. When transition flashing is pre-installed prior to application of Fluid Applied Membrane, apply transition flashing as above. Spray or trowel a continuous uniform film of Fluid Membrane at min. 60 mils (1.5 mm or .060 in.) dry film thickness using multiple, overlapping passes, with a minimum overlap of 75 mm (3 in.) onto transition flashing. For sill condition, spray or trowel Fluid Membrane onto pre-installed sill flashing and onto horizontal section of sill.

F. Application of Flexible Membrane Wall Flashing

1. Prime substrate to receive wall flashing as required per manufacturers written instructions.
2. Precut pieces of flashing to easily handled lengths for each location.
3. Remove silicone-coated release paper and position flashing carefully before placing it against the surface.

4. When properly positioned, place against surface by pressing firmly into place by hand roller. Fully adhere flashing to substrate to prevent water from migrating under flashing.
5. Overlap adjacent pieces 76 mm (3 in.) and roll all seams with a hand roller.
6. Trim bottom edge 13 mm (1/2 in.) back from exposed face of the wall. Flashing shall not be permanently exposed to sunlight.
7. At heads, sills and all flashing terminations, turn up ends a minimum of 76 mm (3 in.) and make careful folds to form an end dam, with the seams sealed.
8. Seal all non-factory cuts with liquid membrane.
9. Seal top edge of flashing with liquid membrane.
10. Do not allow the rubberized asphalt surface of the flashing membrane to come in contact with poly-sulfide sealants, creosote, uncured coal tar products or EPDM.

3.4 PROTECTION AND CLEANING

- A. Remove any masking materials after installation. Clean any stains on materials that would be exposed in the completed work using procedures as recommended by manufacturer.
- B. Wall membrane is not suitable for permanent exposure and should be protected from the effects of sunlight.
- C. Schedule work to ensure that the Wall Membrane system is covered as soon as possible after installation. Protect wall membrane system from damage during subsequent operations. If the wall membrane system cannot be covered within 30 days after installation, apply temporary UV protection such as dark plastic sheet or tarpaulins.

- END OF SECTION -

- SECTION 07 2726 -

VAPOR PERMEABLE VAPOR BARRIER

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes permeable air and vapor barriers.

1.3 RELATED SECTIONS

- A. Section 06 1600 "Sheathing" for exterior sheathing.
- B. Section 07 2713 "Self-Adhered Sheet Membrane Air Barrier".
- C. Section 07 4215 "Glass Facade Panel System" for glass facade panels.
- D. Section 07 6200 "Sheet Metal Flashing and Trim" for sheet metal flashings.
- E. Section 07 9200 "Joint Sealants" for joint-sealant materials and installation.

1.4 PERFORMANCE REQUIREMENTS

- A. General: Air barrier shall be capable of performing as a continuous vapor-retarding air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

1.5 REFERENCES

- A. AATCC Test Method 127 - Water Resistance: Hydrostatic Pressure Test; 1998.
- B. ASTM E 84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
- C. ASTM E 96 - Standard Test Methods for Water Vapor Transmission of Materials; Compliant with Procedure B (Water Method) for interior to exterior testing.

1.6 SUBMITTALS

- A. Product Data: Include manufacturer's written instructions, technical data, and tested physical and performance properties of breathable underlayment.
- B. Shop Drawings: Show locations and extent of air barrier. Include details for substrate joints and cracks, counterflashing strip, penetrations, window and door sequences, inside and outside corners, terminations, and tie-ins with adjoining construction.
- C. Manufacturer's Instructions: Provide manufacturer's instructions showing the recommended procedures and sequence of installation of breathable underlayment in Rainscreen installations.

1.7 QUALITY ASSURANCE

- A. Underlayment manufacturer shall have an on-going quality control program with inspections by a nationally recognized independent organization and shall be so labeled.
- B. Source Limitations: Obtain all breathable underlayment through one source from a single manufacturer.
- C. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review requirements for underlayment, including surface preparation specified under other Sections, substrate condition and pretreatment, temporary weather protection, forecasted weather conditions, special details and sheet flashings, installation procedures, testing and inspection procedures, and protection and repairs.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in original containers with seals unbroken, wrapped in a polythene sleeve, labeled with manufacturer's name, and product brand name.
- B. Store rolls under cover, on a clean, level surface, either flat or upright.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design Product: The design is based on WrapShield manufactured by VaproShield™ L.L.C., distributed by W.H. Steele Co., phone (626) 303-3831. website: www.VaproShield.com

2.2 PHYSICAL PROPERTIES

- A. Spun Bonded Polypropylene: Underlayment shall be furnished in standard rolls of 59" high (1-1/2 meters) and 164 feet (50 meters) long.
- B. Thickness and Weight: 0.020 inches thick and 5.014 oz./ sq. yd.
- C. Tensile Strength: ASTM D 822, Pass.

VAPOR PERMEABLE VAPOR BARRIER

- D. Dry Breaking Force: ASTM D 5034, Pass.
- E. Water Resistance (control and weathered specimens): AATCC 127, Pass.
- F. Water Resistance (Ponding): ASTM D 779, Pass.
- G. Water Vapor Transmission: ASTM E 96, Pass.
- H. Low Temperature Bend: AC38, Pass.
- I. Air Permeance of Building Materials: ASTM 2178, Pass.
- J. Air Leakage through Wall Systems: ASTM E 283, Pass.
- K. Air Retarder Materials and Systems: ASTM 1677, Pass.
- L. Water Resistance (UBC Flashing Requirements): ASTM 2112, Pass.
- M. Color: Black.
- N. Surface Burning Characteristics: ASTM E 84
 - 1. Flame Spread: Class A
 - 2. Smoke Developed: Class A

2.3 AUXILIARY MATERIALS

- A. Membrane Flashing:
 - 1. Factory Formed Corners
 - a. VaproFlashing Factory Formed Corners 18" x 18", distributed by VaproShield L.L.C.
- B. Tape: Single-Sided Tape:
 - 1. 2 inch VaproTape, single-sided, 30 mil.
 - 2. 4 inch VaproTape UV Black.
- C. Flashing Tape: Butyl-Based foil-faced tape:
 - 1. Polyken 626-35 manufactured by Berry Plastics Corp.
- D. Primer: For use where the butyl-based foil-faced tape adheres directly to the exterior gypsum sheathing.
 - 1. Primer: Perm-A-Barrier WB Primer by Grace Construction Products.
- E. Caulk and Sealant: As specified in Section 07 9200.
- F. Fasteners: Exterior Gypsum Substrate Application: Do not locate screws where they will interfere with installation of the cladding elements.
 - 1. Elco Dril-Flex 12-14 x 1 inch fasteners with 1-1/4 inch stainless steel washers.
 - 2. Staples: 1/2 inch Arrow T50 galvanized staples for use as outlined in Part 3, Installation Instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with installer present, for compliance with requirements and other conditions affecting performance.

3.2 SURFACE PREPARATION

- A. Clean and prepare substrate according to manufacturer's written recommendations. Provide clean and dry substrate for breathable underlayment application.

3.3 PENETRATIONS

- A. Contractor to confirm there are no pipe and conduit penetrations on subject walls.
- B. Doors and windows:
 - 1. Provide shop drawings for door and window sequences.
 - 2. Follow installation instructions below.

3.4 INSTALLATION INSTRUCTIONS

- A. Install membranes in accordance with manufacturer's instructions over exterior gypsum sheathing and metal studs. Secure the membrane so that the subsurface is protected from weather until cladding can be installed.
- B. Material Compatibility: Do not allow WrapShield to contact asphalt or an asphalt-based product. Cover cut edges of any asphalt-based products. Polyken Foilastic and VaproTape are acceptable covers.
- C. Install VaproFlashing Factory Formed Corners at all four (4) corners of any window opening within the glass facade panel wall. Staple pre-formed corners into wall sheathing using 1/2 inch Arrow T50 galvanized staples. Six staples are required per corner piece.
- D. Apply WrapShield (black) to wall sheathing. One layer of WrapShield is applied horizontally starting at bottom of wall. Shingled layers continue up wall to face of parapet at top of wall. All window openings are completely covered up with WrapShield during this operation. All horizontal or vertical laps to be 12 inch laps. 1/2 inch Arrow T50 galvanized staples are used at perimeter of WrapShield (within 10 inches of edge of WrapShield) to temporarily adhere WrapShield to wall. All staples will be located beneath laps in WrapShield. The temporary installation of WrapShield with staples allows for efficient installation of primary attachment with fasteners and washers. After WrapShield is stapled to wall, Elco Dril-Flex 12-14 x 1 inch fasteners and washer will occur within one day of staple installation. Fasteners with washers are staggered at 32 inches o.c. horizontally, 24 inches o.c. vertically. Locations of glass panel perimeter extrusions to be identified so that interference with screw heads is avoided. Use of VaproTape at overlap locations not required as minimum lap requirements are achieved.

- E. After wall is completely covered with WrapShield, the WrapShield is pie-cut and folded back into window openings. WrapShield is trimmed off to the back edge of stud and is taped off to stud using 2" gray VaproTape Single-Sided. Polyken Foilastic 626~35 is installed around perimeter of window opening over WrapShield. The Polyken is used as backing for sealant adhesion at composite window trims and window extrusions.
- F. After window trim extrusions and glass panel extrusions are installed and all shimming and fastener adjustments have been made, Polyken Foilastic 626-35 is applied over up-turn leg of extrusion.
- G. At the parapet location, WrapShield terminates at top of wall (at face), Perm-A-Barrier Wall Membrane is applied at the back side of parapet and Polyken Foilastic 626-35 laps over face of WrapShield and Perm-A-Barrier.
- H. Any Perm-A-Barrier Wall Membrane adjacent to WrapShield needs to be taped off at termination points so that WrapShield is completely isolated from the rubberized asphalt-based adhesive of Perm-A-Barrier backing. The 2 inch VaproTape Single-Sided or 4 inch VaproTape UV Black will be used to tape off edge of Perm-A-Barrier.
- I. Any holes that may develop in WrapShield during the installation process are to be patched using 4 inch VaproTape UV Black.

3.5 PROTECTING AND CLEANING

- A. Protect installed breathable underlayment from damage due to harmful weather exposures, physical abuse, and other causes.
 - 1. Repair torn breathable underlayment as follows:
 - a. Insert a full height piece of underlayment extending 12 inches horizontally beyond the damage and extend up and under the underlayment above. Mechanically attach underlayment to substrate top and bottom.
- B. Remove mud and similar marks with a water scrub. If chemicals have been spilled on underlayment, treat as a tear and repair as stated above.

- END OF SECTION -

- SECTION 07 4213 -

METAL WALL PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Factory-formed and field-assembled, exposed fastener, metal wall panels for mechanical screen wall and backside of parapets.

1.3 RELATED SECTIONS

- A. Section 01 74 19 "Materials Recycling & Waste Management".
- B. Section 01 81 13 "LEED Certification Requirements".
- C. Section 05120 "Structural Steel" for the support frame which wall panels are to be installed.
- E. Section 05500 "Metal Fabrications" for miscellaneous steel.
- F. Section 07620 "Sheet Metal Flashing and Trim" for screen wall coping, and miscellaneous trim.
- G. Section 07920 "Joint Sealants" for field-applied sealants not otherwise specified in this Section.

1.4 REFERENCED STANDARDS

- A. ASTM A 653 – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- B. ASTM A 792 – Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
- C. ASTM B 117 – Standard Practice for Operating Salt Spray (Fog) Apparatus.
- D. ASTM C 920 – Standard Specification for Elastomeric Joint Sealants.
- E. ASTM D 968 – Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive.

- F. ASTM D 2244 – Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates.
- G. ASTM D 2247 – Standard Practice for Testing Water Resistance of Coatings in 100% Relative Humidity.
- H. ASTM D 4214 – Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films.
- I. ASTM E 84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
- J. ASTM E 1592 – Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference.
- K. Metal Construction Association - Preformed Metal Wall Guidelines

1.5 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide metal wall panel assemblies capable of withstanding the effects the following loads and stresses within limits and under conditions indicated, based on testing according to ASTM E 1592:
 - 1. Wind Loads: Determine loads based on the following minimum design wind pressures:
 - a. Uniform pressure of 20-lbf/sq. ft., acting inward or outward.
 - 2. Deflection Limits: Metal wall panel assemblies shall withstand wind loads with horizontal deflections no greater than 1/180 of the span.
 - a. Load: 30-lbf/sq. ft.
- B. Seismic Performance: Provide metal wall panel assemblies capable of withstanding the effects of earthquake motions determined according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads."

1.6 SUBMITTALS

- A. Product Data: For each type of metal wall panel and accessory indicated.
- B. LEED Submittal: See Section 018113 LEED Certification Requirements for the following:
 - 1. MRc4 Recycled Content: Product data for products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content.
 - a. Include cost information for each product having recycled content.
 - 2. MRc5 Regional Materials:
 - a. Sourcing location(s): indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery from the project site.
 - b. Manufacturing location(s): indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
 - c. Product Value: indicate dollar value of product containing regional materials; include materials costs only.

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- d. Product Component(s) Value: Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.
- C. Shop Drawings: Show layouts of metal wall panels, including plans, elevations, sections, details, and attachments to other work.
 - 1. Include details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories.
- D. Coordination Drawings: Drawn to scale (1/4-inch equals one-foot scale) and coordinating metal wall panel installation with penetrations and wall-mounted items.
- E. Samples: For each exposed finish.
- F. Material certificates.
- G. Product test reports.
- H. Maintenance data.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
 - 1. Installer's responsibilities include fabricating and installing metal wall panel assemblies.
 - 2. Panel fabricator and installer shall be experienced and acceptable to panel manufacturer.
- B. Surface-Burning Characteristics: Provide insulated metal wall panels having insulation-core materials with the following surface-burning characteristics as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
 - 1. Flame-Spread Index: 25 or less.
 - 2. Smoke-Developed Index: 450 or less.
- C. Maximum deviation from the vertical and horizontal alignment of erected panels shall be no more than 1/4-inch in 20-feet.
- D. Panel supplier shall furnish calculations confirming structural adequacy if requested.
- E. Painted surfaces of panels shall meet all criteria printed in the manufacturer's literature.
- F. Where possible, field measurements shall be taken prior to completion of shop fabrication.

1.8 PRODUCT DELIVERY, HANDLING AND STORAGE

- A. Protect panel finish and edges per panel manufacturer's recommendations.
- B. Store material in accordance with panel manufacturer's recommendations.

1.9 WARRANTY

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

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Aluminum Sheet: Coil-coated sheet, **ASTM B 209 (ASTM B 209M)**, alloy as standard with manufacturer, with temper as required to suit forming operations and structural performance required.
 - 1. Surface: Smooth, flat finish.
 - 2. Exposed Coil-Coated Finish:
 - a. 2-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

- B. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of **0.5 mil (0.013 mm)**.

- C. Panel Sealants:
 - 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 (13 mm) wide and 1/8 inch (3 mm) thick.
 - 2. Joint Sealant: ASTM C 920; elastomeric polyurethane, polysulfide, or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal wall panels and remain weathertight; and as recommended in writing by metal wall panel manufacturer.

2.2 EXPOSED-FASTENER, LAP-SEAM METAL WALL PANELS

- A. General: Provide factory-formed metal wall panels designed to be field assembled by lapping side edges of adjacent panels and mechanically attaching panels to supports using exposed fasteners in side laps. Include accessories required for weathertight installation.
- B. Corrugated-Profile, Exposed-Fastener Metal Wall Panels: Formed with alternating curved ribs spaced at **2.67 inches (68 mm)** o.c. across width of panel.
 - 1. Basis of Design: Exterior panel shall be Belvedere Corrugated Panel BWC374 as manufactured by Atas International, Inc., Mesa, AZ, tel: (480) 558-7210, web: www.atas.com. Profile shall have 37-1/4 inches of coverage width and 7/8-inch deep symmetrical corrugations spaced at 2-2/3 inches o.c.
 - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AEP Span
 - b. Centria Architectural Systems.
 - c. McElroy Metal.
- C. Material: Aluminum sheet, **0.040 inch (1.02 mm)** thick.
 - 1. Exterior Finish: 2-coat fluoropolymer.
 - 2. Color: As selected by Owner.
- D. Panel Coverage: **37.3 inches (947 mm)**.
- E. Panel Height: **0.875 inch (22 mm)**
- F. All exterior flashing and trim shall be fabricated in the same material, gage, finish, and color as the exterior profile, unless otherwise noted.
- G. Subgirts shall be fabricated from minimum 16 gage zinc coated steel conforming to ASTM A 653 SQ Grade 37, G90 coating

2.3 MISCELLANEOUS MATERIALS

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

2.4 ACCESSORIES

- A. Wall Panel Accessories: Provide components required for a complete metal wall panel assembly including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal wall panels, unless otherwise indicated.
 - 1. Closures: Provide closures at eaves and rakes, fabricated of same metal as metal wall panels.
 - 2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.

- B. Flashing and Trim: Formed from **0.018-inch (0.46-mm)** minimum thickness, zinc-coated (galvanized) steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal wall panels.

2.5 FABRICATION

- A. General: Fabricate and finish metal wall panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. Fabricate metal wall panels in a manner that eliminates condensation on interior side of panel and with joints between panels designed to form weathertight seals.
- C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- D. Fabricate metal wall panel joints with factory-installed captive gaskets or separator strips that provide a tight seal and prevent metal-to-metal contact, and that will minimize noise from movements within panel assembly.
- E. Sheet Metal Accessories: Fabricate flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of item indicated.
 - 1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
 - 2. Seams for 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 elastomeric sealant to comply with SMACNA standards.
 - 4. Exposed fasteners are allowed on faces of accessories exposed to view. Fasteners shall be the same color as the panel.
 - 5. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended by metal wall panel manufacturer.
 - a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal wall panel manufacturer for application but not less than thickness of metal being secured.

2.6 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

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- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.7 METAL 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: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Panel substructure shall be level and plumb.
- B. Panel substructure shall be structurally sound as determined by Engineer.
- C. Panel substructure shall be free of defects detrimental to work.
- D. Panel installer shall inspect substructure and shall not proceed with panel erection until any deviations are corrected.

3.2 METAL WALL PANEL INSTALLATION

- A. General: Install metal wall panels according to manufacturer's written instructions in orientation, sizes, and locations indicated on Drawings. Install panels' perpendicular to girts and subgirts unless otherwise indicated. Anchor metal wall panels and other components of the Work securely in place, with provisions for thermal and structural movement.
 1. Commence metal wall panel installation and install minimum of 150 sq. ft. (13.9 sq. m.) in presence of factory-authorized representative.
 2. Shim or otherwise plumb substrates receiving metal wall panels at back side of parapet only.
 3. Flash and seal metal wall panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until weather barrier and flashings that will be concealed by metal wall panels are installed.
 4. Install screw fasteners in predrilled holes.
 5. Locate and space fastenings in uniform vertical and horizontal alignment.

6. Install flashing and trim as metal wall panel work proceeds.
 7. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
 8. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete and elsewhere as indicated or, if not indicated, as necessary for waterproofing.
 9. Align bottom of metal wall panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
 10. Provide weathertight escutcheons for pipe and conduit penetrating exterior walls.
 11. Corrugations to be oriented horizontally at mechanical screen wall.
 12. Corrugations to be oriented vertically at back side of parapets.
- B. Fasteners:
1. Aluminum Wall Panels: Use aluminum or stainless-steel fasteners for surfaces exposed to the exterior; use aluminum or galvanized steel fasteners for surfaces exposed to the interior.
- C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action as recommended by metal wall panel manufacturer.
- D. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weathertight performance of metal wall panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not indicated, types recommended by metal wall panel manufacturer.
1. Seal metal wall panel end laps with double beads of tape or sealant, full width of panel. Seal side joints where recommended by metal wall panel manufacturer.
 2. Prepare joints and apply sealants to comply with requirements in Division 7 Section "Joint Sealants."
- E. Lap-Seam Metal Wall Panels: Fasten metal wall panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.
1. Lap ribbed or fluted sheets one full rib corrugation. Apply panels and associated items for neat and weathertight enclosure. Avoid "panel creep" or application not true to line.
 2. Provide metal-backed washers under heads of exposed fasteners bearing on weather side of metal wall panels.
 3. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.
 4. Install screw fasteners with power tools having controlled torque adjusted to compress washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.
 5. Provide sealant tape at lapped joints of metal wall panels and between panels and protruding equipment, vents, and accessories.
 6. Apply a continuous ribbon of sealant tape to weather-side surface of fastenings on end laps; on side laps of nesting-type panels; on side laps of corrugated nesting-type, ribbed, or fluted panels; and elsewhere as needed to make panels weathertight.
- F. At panel splices, nest panels with minimum **6-inch (152-mm)** end lap, sealed with butyl-rubber sealant and fastened together by interlocking clamping plates

METAL WALL PANELS

3.3 ACCESSORY INSTALLATION

- A. General: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
 - 1. Install components required for a complete metal wall panel assembly including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
- B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
 - 1. Install exposed flashing and trim that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
 - 2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of **10 feet (3 m)** with no joints allowed within **24 inches (605 mm)** 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 (25 mm)** deep, filled with mastic sealant (concealed within joints).

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Water Penetration: Test areas of installed system indicated on Drawings for compliance with system performance requirements according to ASTM E 1105 at minimum differential pressure of 20 percent of inward-acting, wind-load design pressure as defined by SEI/ASCE 7, but not less than **6.24 lbf/sq. ft. (300 Pa)**.
- C. Water-Spray Test: After completing the installation of **75-foot- (23-m-)** by-2-story minimum area of metal wall panel assembly, test assembly for water penetration according to AAMA 501.2 in a 2-bay area directed by Architect.
- D. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect completed metal wall panel installation, including accessories.
- E. Remove and replace metal wall panels where tests and inspections indicate that they do not comply with specified requirements.
- F. Additional tests and inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.5 CLEANING AND PROTECTION

- A. Remove temporary protective coverings and strippable films, if any, as metal wall panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On

completion of metal wall panel installation, clean finished surfaces as recommended by metal wall panel manufacturer. Maintain in a clean condition during construction.

- B. After metal wall panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.
- C. Replace metal wall panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

- END OF SECTION -

- SECTION 07 4215 -

GLASS FACADE PANEL SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes glass facade panel system.

1.3 RELATED SECTIONS

- A. Section 01 74 19 "Materials Recycling & Waste Management".
- B. Section 01 81 13 "LEED Certification Requirements".
- C. Section 05 4000 "Cold-Formed Metal Framing" for cold-formed metal framing supporting glass facade panel system.
- D. Section 07 2726 "Vapor Permeable Air Barrier" for continuous air barrier system.
- E. Section 07 4219 "Metal Plate Wall Panels" for wall plate wall panel assembly.
- F. Section 07 6200 "Sheet Metal Flashing and Trim" for field-formed flashings and other sheet metal work not part of glass facade panel system.
- G. Section 08 8000 "Glazing" for spandrel glass.
- H. Section 08 4113 "Aluminum Framed Entrances and Storefronts".

1.4 DEFINITION

- A. Glass Façade Panel System: Glass facade panels, attachment system components, miscellaneous metal framing, and accessories necessary for a complete weathertight wall system.

1.5 PERFORMANCE REQUIREMENTS

- A. General Performance: Glass facade panel system shall comply with performance requirements without failure due to defective manufacture, fabrication, installation, or other defects in construction.
- B. Material Stress and Deflection
1. Normal to the plane of the wall between structural supports, deflection of the attached perimeter-framing members shall not exceed $L/175$ of span length or 3/4 inch; whichever is less.
 2. At connection points of framing members to anchors, anchor deflection in any direction shall not exceed 1/16 inch. Where connection points are not clearly defined, maximum anchor deflection shall not exceed 1/16 inch.
 3. Stresses must take into account interaction and in no case shall allowable values exceed the yield stress.
 4. At 1.5 times design pressure, permanent deflection of framing members must not exceed $L/100$ of the span length, and components must not experience failure or gross permanent distortion. At connection points of framing members to anchors, permanent set shall not exceed 1/16 inch
- C. Air Infiltration: Air leakage through assembly of not more than **0.06 cfm/sq. ft. (0.3 L/s per sq. m)** of wall area when tested according to ASTM E 283 at the following test-pressure difference:
1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa).
- D. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 331 at the following test-pressure difference:
1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa).
- E. Water Penetration under Dynamic Pressure: No evidence of water leakage when tested according to AAMA 501.1 under dynamic pressure equal to 20 percent of inward-acting, wind-load design pressure of not less than **6.24 lbf/sq. ft. (300 Pa)** and not more than **12 lbf/sq. ft. (575 Pa)**.
1. Water Leakage: Uncontrolled water infiltrating the system or appearing on system's normally exposed interior surfaces from sources other than condensation. Water controlled by flashing and gutters that is drained back to the exterior and cannot damage adjacent materials or finishes is not water leakage and according to AAMA 501.1.
- F. Structural Performance: Provide glass facade panel system capable of withstanding the effects of the following loads and stresses within limits and under conditions indicated, based on testing according to ASTM E 330:
1. Wind Loads: Determine loads based on the following minimum design wind pressures:
 - a. Uniform pressure of 30 lbf/sq. ft. (1436 Pa), acting inward or outward.
 2. Deflection Limits: Glass facade panel system shall withstand wind loads with horizontal deflections no greater than $1/175$ of the span.
- G. 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.

GLASS FACADE PANEL SYSTEM

1. Temperature Change (Range): -12 deg F (-24 deg C), ambient; 180 deg F (100 deg C), material surfaces.

- H. Seismic Racking: There shall be no failure or deterioration of the system when the unit is laterally racked to $\frac{3}{4}$ " in both directions and repeated for three (3) cycles. System must pass the static water requirements as described in the *Static Water Infiltration Section 1.5 A-2* following the seismic racking.

1.6 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of glass facade panel system and accessory.
- B. LEED Submittal: See Section 018113 LEED Certification Requirements for the following:
1. MRc4 Recycled Content: Product data for products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content.
 - a. Include cost information for each product having recycled content.
 2. MRc5 Regional Materials:
 - a. Sourcing location(s): indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery from the project site.
 - b. Manufacturing location(s): indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
 - c. Product Value: indicate dollar value of product containing regional materials; include materials costs only.
 - d. Product Component(s) Value: Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.
 3. EQc4.1 Adhesives & Sealants: Product data for adhesives & sealants, including printed statement of VOC content and chemical components.
- C. Shop Drawings: Show fabrication and installation layouts of glass facade panel system; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details. Distinguish among factory-, shop-, and field-assembled work.
1. Accessories: Include details of the following items, at a scale of not less than 1-1/2 inches per 12 inches (1:10):
 - a. Flashing and trim.
 - b. Anchorage systems.
- D. Samples for Initial Selection: For each type of glass facade panel system indicated with factory-applied color finishes.
1. Include similar Samples of trim and accessories involving color selection.
 2. Include manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each sealant exposed to view.

- E. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:
 - 1. Glass facade panel system: 12 inches (300 mm) long by actual panel width. Include fasteners, closures, and other panel accessories fabricated into units representative of the actual system.
 - 2. Trim and Closures: 12 inches (300 mm) long. Include fasteners and other exposed accessories.
 - 3. Accessories: 12-inch- (300-mm-) long Samples for each type of accessory.
 - 4. Exposed Sealants: For each type and color of joint sealant required. Install joint sealants in 1/2-inch- (13-mm-) wide joints formed between two 6-inch- (150-mm-) long strips of material matching the appearance of glass facade panel system adjacent to joint sealants.

- F. Coordination Drawings: Exterior elevations, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Glass facade panels and attachments.
 - 2. Girts
 - 3. Wall-mounted items including doors, windows, louvers, and lighting fixtures.
 - 4. Penetrations of wall by pipes and utilities.

- G. Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:
 - 1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
 - 2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

- H. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.

- I. Field quality-control reports.

- J. Maintenance Data: For glass facade panels to include in maintenance manuals.

- K. Warranties: Sample of special warranties.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
 - 1. Installation History: Installer shall be a firm that has at least five (5) years of experience with exterior wall applications and has successfully completed installations of similar scope and size to this project.

- B. Fabricator Qualifications: Fabricator capable of providing field service representation during construction, approving acceptable installer and application method.
 - 1. Fabrication History: Panel fabricator shall assume undivided responsibility for all components of the panel work, and shall demonstrate no less than ten (10) years successful experience of glass facade panel work similar in scope and size to this project.

- C. **Manufacture Qualifications:** Manufacturer experience in performing work of this section that has experience with the specified materials.
1. Manufacturer of the glass material must have at least ten (10) years experience in the production of the specified material.
 2. Manufacturers of the accessories and perimeter framing extrusions must have at least five (5) years experience in the production of their respective products.
- D. **Testing Agency Qualifications:** Qualified according to ASTM E 329 for testing indicated.
- E. **Source Limitations:** Obtain each type of glass facade panels from single source from single manufacturer.
- F. **Preconstruction Compatibility and Adhesion Testing:** Submit samples of materials that will contact joint sealants to joint-sealant manufacturers for testing indicated below:
1. Use manufacturer's standard test methods to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
 - a. Perform tests under environmental conditions replicating those that will exist during installation.
 2. Submit no fewer than nine pieces of each type of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
 3. Schedule enough time for testing and analyzing results to prevent delaying the Work.
 4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures, including use of specially formulated primers.
- G. **Fire-Resistance Ratings:** Where indicated, provide glass facade panel system identical to those of assemblies tested for fire resistance per ASTM E 119 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.
- H. **Mockups:** Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
1. Build mockup of typical wall including corner panel as shown on Drawings; approximately one bay wide by one story high by full thickness, including insulation, supports, attachments, and accessories. Include four-way joint.
 2. Conduct water-spray test of mockup of glass facade panel system, testing for water penetration according to AAMA 501.2.
 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- I. **Preinstallation Conference:** Conduct conference at Project site.
1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, glass facade panel system Installer, glass facade panel system manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects panels including installers of doors, windows, and louvers.

2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review methods and procedures related to glass facade panel system installation, including manufacturer's written instructions.
4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
5. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that will affect glass facade panel system.
6. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
7. Review temporary protection requirements for glass facade panel system during and after installation.
8. Review glass facade panel system observation and repair procedures after installation.

1.8 DELIVERY, STORAGE, AND HANDLING

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

1.9 PROJECT CONDITIONS

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

1.10 COORDINATION

- A. Coordinate glass facade panel system with rain drainage work, flashing, trim, and construction of studs, soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.11 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of glass facade panel system 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.

PART 2 - PRODUCTS**2.1 GLASS FACADE PANEL SYSTEM**

- A. Basis-of-Design Fabricator: "CSP" Architectural Glass Panels as manufactured by C/S Erectors Inc. San Ramon, CA (925) 820-8113.
 - 1. Perimeter Extrusions: Extruded aluminum with integral weather stripping as detailed on drawings so as to provide the following essential features.
 - a. Dry-joint floating glass spandrels with perimeter extrusions painted to match spandrel glass, panel joints nominal 1/2 inch.
 - b. Spandrel glass, heat strength with polished edges.
 - c. Maximum overall panel thickness, including the attachment shim space shall not exceed 2 inches.
 - d. Extruded trims and end closures.
 - e. Sadev Décor full capture stainless steel fittings, Model # 06 34 20.
- B. Panel Depth: As indicated.
- C. Attachment System Components: Formed from extruded aluminum.
 - 1. Provide internal drainage system that allows individual panels to be installed and removed without disturbing adjacent panels.
 - 2. Include manufacturer's standard subgirts, perimeter extrusions, tracks, and drainage channels, , panel clips and anchor channels.
 - 3. Alignment Pins: Stainless steel.
- D. Gaskets: Santoprene or EPDM.
- E. Fasteners: Attachment of the panel system to the primary panel structural supports shall be made using Drill-Flex Fasteners by ELCO Textron, Inc.

2.2 PANEL MATERIALS

- A. Spandrel Glass. Refer to Section 08 8000.
- B. Panel Sealant: ASTM C 920; elastomeric polyurethane, polysulfide, or silicone sealant; of type, grade, class, and use classifications required to seal joints in glass facade panel system and remain weathertight; and as recommended in writing by panel manufacturer.

2.3 MISCELLANEOUS METAL FRAMING

- A. Miscellaneous Metal Framing, General: ASTM C 645, cold-formed metallic-coated steel sheet, ASTM A 653/A 653M, **G40 (Z120)** hot-dip galvanized or coating with equivalent corrosion resistance unless otherwise indicated.
- B. Subgirts: Manufacturer's standard C- or Z-shaped sections, **0.064-inch (1.63-mm)** nominal thickness.
- C. Zee Clips: **0.079-inch (2.01-mm)** nominal thickness.
- D. Base or Sill Channels: **0.079-inch (2.01-mm)** nominal thickness.
- E. Hat-Shaped, Rigid Furring Channels:
 - 1. Nominal Thickness: As required to meet performance requirements but not less than 0.025 inch (0.64 mm).
 - 2. Depth: As indicated.
- F. Cold-Rolled Furring Channels: Minimum **1/2-inch- (13-mm-)** wide flange.
 - 1. Nominal Thickness: As required to meet performance requirements, but not less than 0.064 inch (1.63 mm).
 - 2. Depth: As indicated.
 - 3. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with nominal thickness of **0.040 inch (1.02 mm)**.
 - 4. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, **0.062-inch- (1.57-mm)** diameter wire, or double strand of **0.048-inch- (1.22-mm-)** diameter wire.
- G. Fasteners for Miscellaneous Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten miscellaneous metal framing members to substrates.

2.4 MISCELLANEOUS MATERIALS

- A. Aluminum Extrusions: **ASTM B 221 (ASTM B 221M)**, alloy and temper recommended by manufacturer for type of use and finish indicated.
- B. Panel Fasteners: Self-tapping screws; bolts and nuts; self-locking rivets and bolts; end-welded studs; and other suitable fasteners designed to withstand design loads. Provide exposed fasteners with heads matching color of metal wall panels by means of plastic caps or factory-applied coating. Provide EPDM, PVC, or neoprene sealing washers.
- C. StandOffs: 3/4 inch diameter barrels, 1 inch high, Model #CAP34BS, brushed stainless steel, tapped through full length, 1/4-20 thread size and all other components for a complete installation as manufactured by C.R. Laurence Co., Inc.

2.5 AIR BARRIER

- A. Refer to Section 07 2713 "Self-Adhered Sheet Membrane Air Barrier" for continuous air barrier system.

2.6 ACCESSORIES

- A. Glass Facade Panel System Accessories: Provide components required for a complete glass facade 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 plate wall panels unless otherwise indicated.
- B. Flashing and Trim: Same material, finish, and color as adjacent metal plate wall panels, minimum **0.030 inch (0.76 mm)** thick unless otherwise indicated.

2.7 FABRICATION

- A. General: Fabricate and finish glass facade panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. Fabricate glass facade panel system in a manner that eliminates condensation on interior side of panel and with joints between panels designed to form weathertight seals.
- C. Glass Facade Panels: Fabricate panels as required to comply with deflection limits. Weld and grind panel corners smooth. Fabricate panels to the following dimensional tolerances:
 - 1. Length and Width: Plus or minus 0.032 inch (0.81 mm) up to 48 inches (1219 mm); 0.064 inch (1.63 mm) more than 48 inches (1219 mm).
 - 2. Diagonal: Plus or minus **0.1875 inch (4.76 mm)**.
 - 3. Panel Bow: Not more than 0.2 percent of panel width or length up to **0.1875 inch (4.76 mm)** maximum.
 - 4. Thickness: Plus or minus **0.008 inch (0.2 mm)**.
 - 5. Squareness: **0.1875-inch (4.76-mm)** difference between diagonal measurements.
 - 6. Camber: **0.032 inch (0.81 mm)**.
- D. Sheet Metal Accessories: Fabricate flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.
 - 1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
 - 2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
 - 3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
 - 4. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.
 - 5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
 - 6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended by glass facade panel system manufacturer.

- a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or glass facade panel system manufacturer for application, but not less than thickness of metal being secured.

2.8 GENERAL FINISH REQUIREMENTS

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

2.9 ALUMINUM FINISHES

- A. 2-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
- B. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).

PART 3 - EXECUTION

3.1 EXAMINATION

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

GLASS FACADE PANEL SYSTEM

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

3.2 PREPARATION

- A. Miscellaneous Framing: Install subgirts, base angles, sills, furring, and other miscellaneous glass facade panel support members and anchorage according to ASTM C 754 and panel manufacturer's written instructions.

3.3 AIR BARRIER INSTALLATION

- A. Refer to Section 07 2713 "Self-Adhered Sheet Membrane Air Barrier" for continuous air barrier system installation.

3.4 GLASS FACADE PANEL SYSTEM INSTALLATION

- A. General: Install glass facade panels according to manufacturer's written instructions in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to girts and subgirts unless otherwise indicated. Anchor panels and other components of the Work securely in place, with provisions for thermal and structural movement.
 1. Commence glass facade panel installation and install minimum of 300 sq. ft. (27.8 sq. m) in presence of factory-authorized representative.
 2. Shim or otherwise plumb substrates receiving glass facade panels.
 3. Flash and seal glass facade panel system with weather closures at perimeter of all openings. Do not begin installation until weather barrier and flashings that will be concealed by panels are installed.
 4. Install flashing and trim as glass facade panel work proceeds.
 5. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as indicated or, if not indicated, as necessary for waterproofing.
 6. Provide preformed weathertight escutcheons for pipe and conduit penetrating exterior walls.
- B. Fasteners:
 1. Aluminum Plate Wall Panels: Use aluminum or stainless-steel fasteners for surfaces exposed to the exterior and aluminum or galvanized-steel fasteners for surfaces exposed to the interior.
- C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action as recommended by glass facade panel system manufacturer.
- D. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weathertight performance of glass facade panel system. Provide types of gaskets, fillers, and sealants indicated or, if not indicated, types recommended by panel manufacturer.
 1. Seal glass facade panel system end laps with double beads of sealant, full width of panel. Seal side joints where recommended by panel manufacturer.
- E. Attachment System, General: Install attachment system required to support glass facade panels and to provide a complete weathertight wall system, including subgirts, perimeter extrusions, tracks, drainage channels, panel clips, and anchor channels.

1. Include attachment to supports, panel-to-panel joinery, panel-to-dissimilar-material joinery, and panel-system joint seals.
- F. Flange-Attachment Installation: Attach glass facade panels, formed with extended perimeter flanges, to supports at locations, spacings, and with fasteners recommended by manufacturer.
1. Seal horizontal and vertical joints between adjacent panels with sealant backing and sealant. Install sealant backing and sealant according to manufacturer's requirements and/or Simpson Gumpertz & Heger's (SGH) recommendations.
 2. Seal horizontal and vertical joints between adjacent panels with manufacturer's standard gaskets.
- G. Clip Installation: Attach panel clips to supports at locations, spacings, and with fasteners recommended by manufacturer. Attach flanges of glass facade panels to panel clips with fasteners or by welding, as recommended by manufacturer.
1. Seal horizontal and vertical joints between adjacent glass facade panels with sealant backing and sealant. Install sealant backing and sealant according to manufacturer's requirements and/or Simpson Gumpertz & Heger's (SGH) recommendations.
 2. Seal horizontal and vertical joints between adjacent glass facade panels with manufacturer's standard gaskets.
- H. Subgirt-and-Spline Installation: Provide manufacturer's standard subgirts and splines that provide support and complete secondary drainage system, draining to the exterior at horizontal joints. Install support system at locations, spacings, and with fasteners recommended by manufacturer. Attach glass facade panels by interlocking perimeter extrusions attached to panels with subgirts and splines. Fully engage integral subgirt-and-spline gaskets and leave horizontal and vertical joints with open reveal. Terminate edge of panels flush with perimeter extrusions.
1. Install glass facade panels to allow individual panels to be installed and removed without disturbing adjacent panels.
 2. Do not apply sealants to joints unless otherwise indicated on Drawings.
- I. Rainscreen-Principle Installation: Provide manufacturer's standard pressure-equalized, rainscreen-principle system with vertical channel that provides support and complete secondary drainage system, draining at base of wall. Notch vertical channel to receive support pins. Install vertical channels supported by channel brackets or adjuster angles and at locations, spacings, and with fasteners recommended by manufacturer. Attach glass facade panels by engaging horizontal support pins into notches in vertical channels and into flanges of panels. Leave horizontal and vertical joints with open reveal.
1. Install glass facade panels to allow individual panels to be installed and removed without disturbing adjacent panels.
 2. Do not apply sealants to joints unless otherwise indicated on Drawings.

3.5 ACCESSORY INSTALLATION

- A. General: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.
1. Install components required for a complete glass facade panel system assembly including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.

- B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
1. Install exposed flashing and trim that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
 2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of **10 feet (3 m)** with no joints allowed within **24 inches (610 mm)** 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 (25 mm)** deep, filled with mastic sealant (concealed within joints).

3.6 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align glass facade panel units within installed tolerance of **1/4 inch in 20 feet (6 mm in 6 m)**, nonaccumulative, on level, plumb, and location lines as indicated and within **1/8-inch (3-mm)** offset of adjoining faces and of alignment of matching profiles.

3.7 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Water Penetration: Test areas of installed system indicated on Drawings for compliance with system performance requirements according to ASTM E 1105 at minimum differential pressure of 20 percent of inward-acting, wind-load design pressure as defined by SEI/ASCE 7, but not less than **6.24 lbf/sq. ft. (300 Pa)**.
- C. Water-Spray Test: After completing the installation of **75-foot- (23-m-)** by-2-story minimum area of glass facade panel system assembly, test assembly for water penetration according to AAMA 501.2 in a 2-bay area directed by Architect.
- D. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust completed glass facade panel system installation, including accessories.
- E. Glass facade panels will be considered defective if they do not pass tests and inspections.
- F. Additional tests and inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- G. Prepare test and inspection reports.

3.8 CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as glass facade panels are installed unless otherwise indicated in manufacturer's written installation instructions. On completion glass facade panel system installation, clean finished surfaces as recommended by panel manufacturer. Maintain in a clean condition during construction.

- B. After glass facade panel system installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.
- C. Replace glass facade panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

- END OF SECTION -

- SECTION 07 4219 -

METAL PLATE WALL PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes metal plate wall panels.

1.3 RELATED SECTIONS

- A. Section 01 74 19 "Materials Recycling & Waste Management".
- B. Section 01 81 13 "LEED Certification Requirements".
- C. Section 05 4000 "Cold-Formed Metal Framing" for cold-formed metal framing supporting metal wall panels.
- D. Section 06 6100 "Sheathing" for building wrap.
- E. Section 07 6200 "Sheet Metal Flashing and Trim" for field-formed flashings and other sheet metal work not part of metal wall panel assemblies.

1.4 DEFINITION

- A. Metal Plate Wall Panel Assembly: Metal plate wall panels, attachment system components, miscellaneous metal framing, and accessories necessary for a complete weathertight wall system.

1.5 PERFORMANCE REQUIREMENTS

- A. General Performance: Metal plate wall panel assemblies shall comply with performance requirements without failure due to defective manufacture, fabrication, installation, or other defects in construction.
- B. Air Infiltration: Air leakage through assembly of not more than **0.06 cfm/sq. ft. (0.3 L/s per sq. m)** of wall area when tested according to ASTM E 283 at the following test-pressure difference:

1. Test-Pressure Difference: 1.57 lbf/sq. ft. (75 Pa).
- C. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 331 at the following test-pressure difference:
 1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa).
- D. Water Penetration under Dynamic Pressure: No evidence of water leakage when tested according to AAMA 501.1 under dynamic pressure equal to 20 percent of inward-acting, wind-load design pressure of not less than 6.24 lbf/sq. ft. (300 Pa) and not more than 12 lbf/sq. ft. (575 Pa).
 1. Water Leakage: Uncontrolled water infiltrating the system or appearing on system's normally exposed interior surfaces from sources other than condensation. Water controlled by flashing and gutters that is drained back to the exterior and cannot damage adjacent materials or finishes is not water leakage and according to AAMA 501.1.
- E. Structural Performance: Provide metal plate wall panel assemblies capable of withstanding the effects of the following loads and stresses within limits and under conditions indicated, based on testing according to ASTM E 330:
 1. Wind Loads: Determine loads based on the following minimum design wind pressures:
 - a. Uniform pressure of 30 lbf/sq. ft. (1436 Pa), acting inward or outward.
 2. Deflection Limits: Metal plate wall panel assemblies shall withstand wind loads with horizontal deflections no greater than 1/180 of the span.
- F. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

1.6 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal plate wall panel and accessory.
- B. LEED Submittal: See Section 018113 LEED Certification Requirements for the following:
 1. MRc4 Recycled Content: Product data for products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content.
 - a. Include cost information for each product having recycled content.
 2. MRc5 Regional Materials:
 - a. Sourcing location(s): indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery from the project site.
 - b. Manufacturing location(s): indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
 - c. Product Value: indicate dollar value of product containing regional materials; include materials costs only.

METAL PLATE WALL PANELS

- d. Product Component(s) Value: Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.
- C. Shop Drawings: Show fabrication and installation layouts of metal plate wall panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details. Distinguish among factory-, shop-, and field-assembled work.
1. Accessories: Include details of the following items, at a scale of not less than 1-1/2 inches per 12 inches (1:10):
 - a. Flashing and trim.
 - b. Anchorage systems.
- D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:
1. Metal Plate Wall Panels: 12 inches (300 mm) long by actual panel width. Include fasteners, closures, and other panel accessories.
 2. Trim and Closures: 12 inches (300 mm) long. Include fasteners and other exposed accessories.
 3. Accessories: 12-inch- (300-mm-) long Samples for each type of accessory.
 4. Exposed Sealants: For each type and color of joint sealant required. Install joint sealants in 1/2-inch- (13-mm-) wide joints formed between two 6-inch- (150-mm-) long strips of material matching the appearance of metal plate wall panels adjacent to joint sealants.
- E. Coordination Drawings: Exterior elevations, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
1. Metal plate wall panels and attachments.
 2. Girts
 3. Wall-mounted items including doors, windows, louvers, and lighting fixtures.
 4. Penetrations of wall by pipes and utilities.
- F. Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:
1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
 2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
- G. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.
- H. Field quality-control reports.
- I. Maintenance Data: For metal plate wall panels to include in maintenance manuals.
- J. Warranties: Sample of special warranties.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
- B. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.
- C. Source Limitations: Obtain each type of metal plate wall panel from single source from single manufacturer.
- D. Preconstruction Compatibility and Adhesion Testing: Submit samples of materials that will contact joint sealants to joint-sealant manufacturers for testing indicated below:
 - 1. Use manufacturer's standard test methods to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
 - a. Perform tests under environmental conditions replicating those that will exist during installation.
 - 2. Submit no fewer than nine pieces of each type of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
 - 3. Schedule enough time for testing and analyzing results to prevent delaying the Work.
 - 4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures, including use of specially formulated primers.
- E. Fire-Resistance Ratings: Where indicated, provide metal plate wall panels identical to those of assemblies tested for fire resistance per ASTM E 119 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.
- F. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
 - 1. Build mockup of typical wall including corner panel as shown on Drawings; approximately one bay wide by one story high by full thickness, including insulation, supports, attachments, and accessories. Include four-way joint.
 - 2. Conduct water-spray test of mockup of metal plate wall panel assembly, testing for water penetration according to AAMA 501.2.
 - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- G. Preinstallation Conference: Conduct conference at Project site.
 - 1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, metal plate wall panel Installer, metal plate wall panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects panels including installers of doors, windows, and louvers.
 - 2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 3. Review methods and procedures related to metal plate wall panel installation, including manufacturer's written instructions.

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4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
5. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that will affect metal plate wall panels.
6. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
7. Review temporary protection requirements for metal plate wall panel assembly during and after installation.
8. Review metal plate wall panel observation and repair procedures after installation.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, metal plate wall panels, and other manufactured items so as not to be damaged or deformed. Package panels for protection during transportation and handling.
- B. Unload, store, and erect metal plate wall panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack metal plate wall panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store panels to ensure dryness, with positive slope for drainage of water. Do not store panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Retain strippable protective covering on metal plate wall panel for period of installation.
- E. Protect foam-plastic insulation as follows:
 1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
 2. Protect against ignition at all times. Do not deliver foam-plastic insulation materials to Project site before installation time.
 3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

1.9 PROJECT CONDITIONS

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

1.10 COORDINATION

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

1.11 WARRANTY

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

PART 2 - PRODUCTS

2.1 PANEL MATERIALS

- A. Aluminum Plate: **ASTM B 209 (ASTM B 209M)**. Alloy and temper as recommended by manufacturer for application.

- B. Panel Sealant: ASTM C 920; elastomeric polyurethane, polysulfide, or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal plate wall panels and remain weathertight; and as recommended in writing by panel manufacturer.

2.2 MISCELLANEOUS METAL FRAMING

- A. Miscellaneous Metal Framing, General: ASTM C 645, cold-formed metallic-coated steel sheet, ASTM A 653/A 653M, **G40 (Z120)** hot-dip galvanized or coating with equivalent corrosion resistance unless otherwise indicated.

- B. Subgirts: Manufacturer's standard C- or Z-shaped sections, **0.064-inch (1.63-mm)** nominal thickness.

- C. Zee Clips: **0.079-inch (2.01-mm)** nominal thickness.

- D. Base or Sill Channels: **0.079-inch (2.01-mm)** nominal thickness.

- E. Hat-Shaped, Rigid Furring Channels:
 - 1. Nominal Thickness: As required to meet performance requirements but not less than 0.025 inch (0.64 mm).
 - 2. Depth: As indicated.

METAL PLATE WALL PANELS

- F. Cold-Rolled Furring Channels: Minimum **1/2-inch- (13-mm-)** wide flange.
1. Nominal Thickness: As required to meet performance requirements, but not less than 0.064 inch (1.63 mm).
 2. Depth: As indicated.
 3. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with nominal thickness of **0.040 inch (1.02 mm)**.
 4. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, **0.062-inch- (1.57-mm)** diameter wire, or double strand of **0.048-inch- (1.22-mm-)** diameter wire.
- G. Fasteners for Miscellaneous Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten miscellaneous metal framing members to substrates.

2.3 MISCELLANEOUS MATERIALS

- A. Aluminum Extrusions: **ASTM B 221 (ASTM B 221M)**, alloy and temper recommended by manufacturer for type of use and finish indicated.
- B. Panel Fasteners: Self-tapping screws; bolts and nuts; self-locking rivets and bolts; end-welded studs; and other suitable fasteners designed to withstand design loads. Provide exposed fasteners with heads matching color of metal wall panels by means of plastic caps or factory-applied coating. Provide EPDM, PVC, or neoprene sealing washers.

2.4 METAL PLATE WALL PANELS

- A. Metal Plate Wall Panels: Provide factory-formed, metal plate wall panels fabricated from single sheets of metal formed into profile for installation method indicated. Include attachment system components, panel stiffeners, and accessories required for weathertight system.
- B. Products: Basis-of-Design Product: The design based on CSP 550 Aluminum Plate Wall Panel System manufactured by CSP Architectural Metals San Ramon, CA , Tel: (925)-820-8113, www.csparchmetals.com.
1. Subject to compliance with requirements, provide the named product or a comparable product by one of the following manufactures:
 - a. Architectural Specialty Products, Inc.
 - b. Firestone - Copper Sales, Inc.; UNA-FAB
 - c. CSP Architectural Metals
 - d. Protean Construction Products, Inc.
 2. Material: Tension-leveled, smooth aluminum sheet, ASTM B 209 (ASTM B 209M), 0.125 inch (3.18 mm) thick.
 3. Panel Depth: **2 inches (51 mm)**.
 4. Exterior Finish: 2-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - a. Color: Alabaster by PPG.
- C. Attachment System Components: Formed from extruded aluminum.

1. Provide internal drainage system that allows individual panels to be installed and removed without disturbing adjacent panels.
2. Include manufacturer's standard subgirts, perimeter extrusions, tracks, and drainage channels, panel stiffeners, panel clips and anchor channels.
3. Alignment Pins: Stainless steel.

2.5 ACCESSORIES

- A. Metal Plate Wall Panel Accessories: Provide components required for a complete metal plate wall panel assembly including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of panels unless otherwise indicated.
- B. Flashing and Trim: Same material, finish, and color as adjacent metal plate wall panels, minimum **0.030 inch (0.76 mm)** thick unless otherwise indicated.

2.6 AIR BARRIER

- A. Refer to Section 07 2713 "Self-Adhered Sheet Membrane Air Barrier".

2.7 FABRICATION

- A. General: Fabricate and finish metal plate wall panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. Fabricate metal plate wall panels in a manner that eliminates condensation on interior side of panel and with joints between panels designed to form weathertight seals.
- C. Metal Plate Wall Panels: Fabricate panels with panel stiffeners as required to comply with deflection limits. Weld and grind panel corners smooth. Fabricate panels to the following dimensional tolerances:
 1. Length and Width: Plus or minus 0.032 inch (0.81 mm) up to 48 inches (1219 mm); 0.064 inch (1.63 mm) more than 48 inches (1219 mm).
 2. Diagonal: Plus or minus **0.1875 inch (4.76 mm)**.
 3. Panel Bow: Not more than 0.2 percent of panel width or length up to **0.1875 inch (4.76 mm)** maximum.
 4. Thickness: Plus or minus **0.008 inch (0.2 mm)**.
 5. Squareness: **0.1875-inch (4.76-mm)** difference between diagonal measurements.
 6. Camber: **0.032 inch (0.81 mm)**.
- D. Sheet Metal Accessories: Fabricate flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.
 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.

METAL PLATE WALL PANELS

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

2.8 GENERAL FINISH REQUIREMENTS

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

2.9 ALUMINUM FINISHES

- A. 2-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
- B. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal plate wall panel supports, and other conditions affecting performance of the Work.

1. Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal plate wall panel manufacturer.
 2. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal plate wall panel manufacturer.
 3. Verify that Perm-A-Barrier® Wall Membrane has been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. Examine roughing-in for components and systems penetrating metal plate wall panels to verify actual locations of penetrations relative to seam locations of panels before installation.
- C. For the record, 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. Miscellaneous Framing: Install subgirts, base angles, sills, furring, and other miscellaneous metal plate wall panel support members and anchorage according to ASTM C 754 and panel manufacturer's written instructions.

3.3 AIR BARRIER INSTALLATION

- A. Refer to Section 07 2713 "Self-Adhered Sheet Membrane Air Barrier". for continuous air barrier system installation.

3.4 METAL PLATE WALL PANEL INSTALLATION

- A. General: Install metal plate wall panels according to manufacturer's written instructions in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to girts and subgirts unless otherwise indicated. Anchor panels and other components of the Work securely in place, with provisions for thermal and structural movement.
1. Commence metal plate wall panel installation and install minimum of 300 sq. ft. (27.8 sq. m) in presence of factory-authorized representative.
 2. Shim or otherwise plumb substrates receiving metal plate wall panels.
 3. Flash and seal metal plate wall panels with weather closures at perimeter of all openings. Do not begin installation until weather barrier and flashings that will be concealed by panels are installed.
 4. Install flashing and trim as metal plate wall panel work proceeds.
 5. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as indicated or, if not indicated, as necessary for waterproofing.
 6. Provide preformed weathertight escutcheons for pipe and conduit penetrating exterior walls.
- B. Fasteners:

METAL PLATE WALL PANELS

1. Aluminum Plate Wall Panels: Use aluminum or stainless-steel fasteners for surfaces exposed to the exterior and aluminum or galvanized-steel fasteners for surfaces exposed to the interior.
- C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action as recommended by metal plate wall panel manufacturer.
- D. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weathertight performance of metal wall plate panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not indicated, types recommended by panel manufacturer.
 1. Seal metal plate wall panel end laps with double beads of sealant, full width of panel. Seal side joints where recommended by panel manufacturer.
- E. Attachment System, General: Install attachment system required to support metal plate wall panels and to provide a complete weathertight wall system, including subgirts, perimeter extrusions, tracks, drainage channels, panel clips, and anchor channels.
 1. Include attachment to supports, panel-to-panel joinery, panel-to-dissimilar-material joinery, and panel-system joint seals.
- F. Flange-Attachment Installation: Attach metal plate wall panels, formed with extended perimeter flanges, to supports at locations, spacings, and with fasteners recommended by manufacturer.
 1. Seal horizontal and vertical joints between adjacent panels with sealant backing and sealant. Install sealant backing and sealant according to manufacturer's requirements and/or Simpson Gumpertz & Heger's (SGH) recommendations. See Sheet C2.
 2. Seal horizontal and vertical joints between adjacent panels with manufacturer's standard gaskets.
- G. Clip Installation: Attach panel clips to supports at locations, spacings, and with fasteners recommended by manufacturer. Attach flanges of metal plate wall panels to panel clips with fasteners or by welding, as recommended by manufacturer.
 1. Seal horizontal and vertical joints between adjacent metal plate wall panels with sealant backing and sealant. Install sealant backing and sealant according to manufacturer's requirements and/or Simpson Gumpertz & Heger's (SGH) recommendations. See Sheet C2.
 2. Seal horizontal and vertical joints between adjacent metal plate wall panels with manufacturer's standard gaskets.
- H. Subgirt-and-Spline Installation: Provide manufacturer's standard subgirts and splines that provide support and complete secondary drainage system, draining to the exterior at horizontal joints. Install support system at locations, spacings, and with fasteners recommended by manufacturer. Attach metal plate wall panels by interlocking perimeter extrusions attached to panels with subgirts and splines. Fully engage integral subgirt-and-spline gaskets and leave horizontal and vertical joints with open reveal. Terminate edge of panels flush with perimeter extrusions.
 1. Install metal plate wall panels to allow individual panels to be installed and removed without disturbing adjacent panels.
 2. Do not apply sealants to joints unless otherwise indicated on Drawings.
- I. Rainscreen-Principle Installation: Provide manufacturer's standard pressure-equalized, rainscreen-principle system with vertical channel that provides support and complete secondary drainage system, draining at base of wall. Notch vertical channel to receive support pins.

Install vertical channels supported by channel brackets or adjuster angles and at locations, spacings, and with fasteners recommended by manufacturer. Attach metal plate wall panels by engaging horizontal support pins into notches in vertical channels and into flanges of panels. Leave horizontal and vertical joints with open reveal.

1. Install metal plate wall panels to allow individual panels to be installed and removed without disturbing adjacent panels.
2. Do not apply sealants to joints unless otherwise indicated on Drawings.

3.5 ACCESSORY INSTALLATION

- A. General: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.
 1. Install components required for a complete metal plate wall panel assembly including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
- B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
 1. Install exposed flashing and trim that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
 2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of **10 feet (3 m)** with no joints allowed within **24 inches (610 mm)** 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 (25 mm)** deep, filled with mastic sealant (concealed within joints).

3.6 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align metal plate wall panel units within installed tolerance of **1/4 inch in 20 feet (6 mm in 6 m)**, nonaccumulative, on level, plumb, and location lines as indicated and within **1/8-inch (3-mm)** offset of adjoining faces and of alignment of matching profiles.

3.7 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Water Penetration: Test areas of installed system indicated on Drawings for compliance with system performance requirements according to ASTM E 1105 at minimum differential pressure of 20 percent of inward-acting, wind-load design pressure as defined by SEI/ASCE 7, but not less than **6.24 lbf/sq. ft. (300 Pa)**.
- C. Water-Spray Test: After completing the installation of **75-foot- (23-m-)** by-2-story minimum area of metal plate wall panel assembly, test assembly for water penetration according to AAMA 501.2 in a 2-bay area directed by Architect.

METAL PLATE WALL PANELS

- D. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust completed metal plate wall panel installation, including accessories.
- E. Metal plate wall panels will be considered defective if they do not pass tests and inspections.
- F. Additional tests and inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- G. Prepare test and inspection reports.

3.8 CLEANING

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

- END OF SECTION -

- SECTION 07 4243 -

COMPOSITE WALL PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. An aluminum-faced composite wall panel system material used in the exterior cladding of exterior and interior walls, and other building components on both vertical and horizontal surfaces.

1.3 RELATED SECTIONS

- A. Section 01 74 19 "Materials Recycling & Waste Management".
- B. Section 01 81 13 "LEED Certification Requirements".
- C. Section 05 4000 "Cold-Formed Metal Framing" for secondary support framing supporting metal wall panels.
- D. Section 06 6100 "Sheathing" for building wrap.
- E. Section 07 6200 "Sheet Metal Flashing and Trim" for flashings and other sheet metal work not part of metal wall panel assemblies.
- F. Section 07 9200 "Joint Sealants" for field-applied sealants not otherwise specified in this Section.
- G. Sheet C2.

1.4 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Capable of withstanding the effects of gravity loads and the following loads and stresses, based on testing according to ASTM E 330:
 - 1. Wind Loads: Minimum design wind pressure of uniform pressure (velocity pressure) of 15.2 lbf/sq. ft. (728 Pa), acting inward and outward when tested according to ASTM E 330).

- B. Seismic Performance: Provide metal wall panel assemblies capable of withstanding the effects of earthquake motions determined according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads."
- C. Thermal Performance: Provide insulated metal wall panel assemblies with thermal-resistance value (R-value) indicated when tested according to ASTM C 236 or ASTM C 518.

1.5 SUBMITTALS

- A. Product Data: For each type of metal wall panel and accessory indicated.
- B. LEED Submittal: See Section 018113 LEED Certification Requirements for the following:
 - 1. MRc4 Recycled Content: Product data for products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content.
 - a. Include cost information for each product having recycled content.
 - 2. MRc5 Regional Materials:
 - a. Sourcing location(s): indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery from the project site.
 - b. Manufacturing location(s): indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
 - c. Product Value: indicate dollar value of product containing regional materials; include materials costs only.
 - d. Product Component(s) Value: Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.
- C. Shop Drawings: Show layouts of metal wall panels, including plans, elevations, sections, details, and attachments to other work.
 - 1. Include details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories.
- D. Coordination Drawings: Drawn to scale and coordinating metal wall panel installation with penetrations and wall-mounted items.
- E. Samples: For each exposed finish.
- F. Material certificates.
- G. Product test reports.
- H. Maintenance data.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
 - 1. Installer's responsibilities include fabricating and installing metal wall panel assemblies.

COMPOSITE WALL PANELS

2. Panel fabricator and installer shall be experienced and acceptable to panel manufacturer
- B. Surface-Burning Characteristics: Provide insulated metal wall panels having insulation-core materials with the following surface-burning characteristics as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
 1. Flame-Spread Index: 25 or less.
 2. Smoke-Developed Index: 450 or less.
 - C. Maximum deviation from the vertical and horizontal alignment of erected panels shall be no more than 1/4" in 20'0" (6mm in 6m).
 - D. Panel supplier shall furnish calculations confirming structural adequacy if requested.
 - E. Painted surfaces of composite panels shall meet all criteria printed in the manufacturer's literature.
 - F. Where possible, field measurements shall be taken prior to completion of shop fabrication.

1.7 PRODUCT DELIVERY, HANDLING AND STORAGE

- A. Protect panel finish and edges per panel manufacturer's recommendations.
- B. Store material in accordance with panel manufacturer's recommendations.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal wall panel assemblies that fail in materials or workmanship within specified warranty period.
 1. Failures include, but are not limited to, the following:
 - a. Structural failures, including rupturing, cracking, or puncturing.
 - b. Deterioration of metals, metal finishes, 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 wall panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
 1. Fluoropolymer Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 ALUMINUM COMPOSITE MATERIAL BUILDING PANELS

- A. Basis of Design: Alucobond Single Skin –Secondary Guttered (Route and Return Dry), aluminum composite material as manufactured by Alcan Composites.

1. Available Products:
 - a. Alusuisse Composites, Inc.; Alucobond.
 - b. Mitsubishi Chemical America, Inc.; Alpolic.
 - c. Reynolds Metals Company; Reynobond PE.

- B. Aluminum-Faced Composite Wall Panels: Formed with 0.020-inch- (0.50-mm-) thick, coil-coated aluminum sheet facings.
 1. Panel Thickness: 0.197 inch (5 mm).
 2. Core: Standard.
 3. Exterior Finish: Fluoropolymer.
 - a. Color: Alabaster by PPG.
 4. Panels shall be furnished by an approved Dealer/Distributor of Reynolds Metals Company.
 5. Composite panels shall have a Class "A" building material rating when tested in accordance with ASTM E84 (Steiner Tunnel Test) and shall exhibit a flame spread of 15 and a smoke developed rating of 120, with a center panel joint. Flame spread of 0, smoke developed of 0 with no joint.
 6. Composite panel shall have passed the ASTM E108 modified test.
 7. Meet requirements of ASTM D635 Rate of Burning Evaluation on Plastic.
 8. Meet requirements of ASTM E906 Heat & Visible Smoke Release Rates.
 9. Pencil Hardness - ASTM D3363-74 Shall be HB-H minimum (Eagle Turquoise).
 10. Impact Adhesion - ASTM D2794-84 Coating shall show no cracking and no loss of adhesion.
 11. Cure Test - NCCA 11-18
 - a. Coating shall withstand 50+ double rubs of MEK soaked cloth.
 12. Humidity Resistance - ASTM D2247-87
 - a. Coating shall show no blisters after 3000 hours of 100% humidity at 95°F.
 13. Salt Spray Resistance - ASTM B117-85
 - a. After 3000 hours of exposure to 5% salt fog, at 95°F, scored sample shall show none or few #8 blisters, and less than 1/8" average creepage from scribe.
 14. Weatherometer Test — ASTM D822-86/G23-81
 - a. Coating shall show no cracking, peeling, blistering or loss of adhesion after 2000 hours.
 - b. Chalking Resistance — ASTM D659-86. No chalk greater than #8 after 10 years Florida exposure at 45°S.
 - c. Color Change — ASTM D2244-74
 - d. Color change shall not exceed 5 NBS units after 10 years Florida exposure at 45°S.
 - e. After 5000 hours in Atlas Weatherometer coating shall show no objectionable chalking or color change. Abrasion Resistance — ASTM D968-81
 15. Coating shall resist 65±15 liters/mil minimum of falling sand.

2.2 PANEL FABRICATION

- A. Composition

COMPOSITE WALL PANELS

1. Aluminum composite material shall be composed of a thermoplastic compound core sandwiched between two aluminum sheets formed into a continuous process.
 2. Bond integrity, per ASTM D1781-76 and ASTM C481 Cycle B, shall be a minimum of 40 inlb/in. (Peel strength).
- B. Aluminum Face Sheets
1. Thickness: .020". Aluminum Alloy shall be 3105 H25.
- C. Tolerances
1. Panel bow shall not exceed 0.8% of panel overall dimension in width or length.
 2. Panel dimensions shall be such that there will be an allowance for field adjustment and thermal movement.
 3. Panel lines, breaks and curves shall be sharp, smooth and free of warps or buckles.
 4. Flatness: Panels shall be visually flat.
- D. Panel surfaces shall be free of scratches or marks caused during fabrication.

2.3 FINISHES

- A. Panel Finishes
1. Coating shall be Colorweld 300 (or Colorweld 300XL), a fluoropolymer coating utilizing 70% Kynar 500 resins.
 - a. Color: Alabaster by PPG.
 - b. Coating shall be factory applied on a continuous process paint line. Coating (Colorweld 300XL) shall consist of a 0.2 mil (approx.) Barrier prime coat and a 0.8 mil (approx.) color coat containing 70% Kynar resins and a 0.5 mil (approx.) clear coat containing 70% Kynar resins. Nominal dry film thickness is 1.50 mils.

2.4 ACCESSORIES

- A. All exposed fasteners shall be self-tapping 300 Series Stainless Steel.
- B. All self-drilling fasteners shall be protected with a corrosion resistant finish.
- C. All sealants shall be compatible with panel materials.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Panel substructure shall be level and plumb.
- B. Panel substructure shall be structurally sound as determined by Architect/Engineer.
- C. Panel substructure shall be free of defects detrimental to work.

- D. Panel installer shall inspect substructure and shall not proceed with panel erection until any deviations are corrected.

3.2 INSTALLATION

- A. Erect panels level and plumb, in proper alignment and relation to substructure framing and established lines.
- B. Panels shall be erected in accordance with an approved set of shop drawings.
- C. Panel anchorage shall be structurally sound and per engineering recommendations, if required.
- D. Where aluminum materials come in contact with dissimilar materials, a bituminous paint or caulking tape shall be installed to insulate between the dissimilar materials. Factory applied protective paint or G-90 galvanized steel is considered adequate insulation.

3.3 ADJUSTING AND CLEANING

- A. Replace panels that have received irreparable damage.
- B. Repair panels with minor damage.
- C. Remove strippable film coating (if used) as soon as possible after surrounding material has been installed. Panel joints shall not be caulked before strippable is removed. Glass above should typically be washed prior to removing strippable film below

- END OF SECTION -

- SECTION 07 5400 -

THERMOPLASTIC MEMBRANE (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 Single Ply Roofing as follows:
 - 1. Adhered TPO membrane roofing system over the following:
 - a. Lightweight concrete.
 - b. Normalweight concrete.
 - 2. Mechanically fastened TPO membrane roofing system at sloped parapet.
 - 3. Roof insulation over concrete.

1.3 RELATED SECTIONS

- A. Section 01 74 19 "Materials Recycling & Waste Management".
- B. Section 01 81 13 "LEED Certification Requirements".
- C. Section 06 1053 "Miscellaneous Rough Carpentry" for sheathing, wood nailers, curbs, and blocking.
- D. Section 07 2100 "Thermal Insulation" for insulation beneath the sloped parapet.
- E. Section 07 6200 "Sheet Metal Flashing and Trim" for metal roof penetration flashings, flashings, and counterflashings.
- F. Section 07 7129 "Manufactured Roof Expansion Joints" for proprietary manufactured roof expansion-joint assemblies.
- G. Section 07 9200 "Joint Sealants" for joint sealants, joint fillers, and joint preparation.
- H. Division 22 Section "Plumbing Systems" for roof drains.

1.4 DEFINITIONS

- A. TPO: Thermoplastic polyolefin.
- B. Roofing Terminology: See ASTM D 1079 and glossary in NRCA's "The NRCA Roofing and Waterproofing Manual" for definitions of terms related to roofing work in this Section.
- C. Total System Warranty: Warranty of the entire roof system including items specified in all project specification sections in connection with the roofing system. One manufacturer to warrant the total system.

1.5 PERFORMANCE REQUIREMENTS

- A. General Performance: Installed membrane roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Membrane roofing and base flashings shall remain watertight.
- B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by membrane roofing manufacturer based on testing and field experience.
- C. Roofing System Design: Provide membrane roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist uplift pressure calculated according to ASCE/SEI 7.
- D. FM Approvals Listing: Provide membrane roofing, base flashings, and component materials that comply with requirements in FM Approvals 4450 and FM Approvals 4470 as part of a membrane roofing system, and that are listed in FM Approvals' "RoofNav" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Approvals markings.
 - 1. Fire/Windstorm Classification: Class 1A-60.
 - 2. Hail Resistance: MH.
- E. Energy Performance: Provide roofing system with initial emissivity not less than 0.75 when tested according to CRRC-1.
- F. Energy Performance: Provide roofing system with initial Solar Reflectance Index not less than 78 when calculated according to ASTM E 1980, based on testing identical products by a qualified testing agency.

1.6 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. LEED Submittals: See Section 018113 LEED Certification Requirements for the following:
 - 1. Product Data for Credit EQ 4.1: For adhesives and sealants, including printed statement of VOC content.
 - 2. MRC4 Recycled Content: Product data for products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content.
 - a. Include cost information for each product having recycled content.

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3. MRc5 Regional Materials:
 - a. Sourcing location(s): indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery from the project site.
 - b. Manufacturing location(s): indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
 - c. Product Value: indicate dollar value of product containing regional materials; include materials costs only.
 - d. Product Component(s) Value: Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.
 4. Product Data for Credit SS 7.2: For roof materials, indicating that roof materials comply with Solar Reflectance Index requirement.
- C. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work.
1. Base flashings and membrane terminations.
 2. Tapered insulation, including slopes.
 3. Roof plan showing orientation of steel roof deck and orientation of membrane roofing and fastening spacings and patterns for mechanically fastened membrane roofing.
 4. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
- D. Samples for Verification: For the following products:
1. Sheet roofing, of color specified, including T-shaped side and end lap seam.
 2. Roof insulation.
 3. 10 lb (4.5 kg) of aggregate ballast in gradation and color indicated.
 4. Roof paver in each color and texture required.
 5. Walkway pads or rolls.
 6. Metal termination bars.
 7. Battens.
 8. Six insulation fasteners of each type, length, and finish.
 9. Six roof cover fasteners of each type, length, and finish.
- E. Qualification Data: For qualified Installer and manufacturer.
- F. 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.
- G. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for components of membrane roofing system.
- H. Research/Evaluation Reports: For components of membrane roofing system, from 2001 CBC..
- I. Field quality-control reports.
- J. Maintenance Data: For roofing system to include in maintenance manuals.

- K. Warranties: Sample of special warranties.

1.7 QUALITY ASSURANCE

- A. **Manufacturer Qualifications:** A qualified manufacturer that is UL listed for membrane roofing system identical to that used for this Project.
- B. **Installer Qualifications:** A qualified firm that is approved, authorized, or licensed by membrane roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.
- C. **Source Limitations:** Obtain components including roof insulation fasteners for membrane roofing system from same manufacturer as membrane roofing or approved by membrane roofing manufacturer.
- D. **Exterior Fire-Test Exposure:** ASTM E 108, Class A; for application and roof slopes indicated, as determined by testing identical membrane roofing materials by a qualified testing agency. Materials shall be identified with appropriate markings of applicable testing agency.
- E. **Fire-Resistance Ratings:** Where indicated, provide fire-resistance-rated roof assemblies identical to those of assemblies tested for fire resistance per ASTM E 119 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- F. **Preliminary Roofing Conference:** Before starting roof deck construction, conduct conference at Project site.
 - 1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
 - 2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
 - 3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 4. Review deck substrate requirements for conditions and finishes, including flatness and fastening.
 - 5. Review structural loading limitations of roof deck during and after roofing.
 - 6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
 - 7. Review governing regulations and requirements for insurance and certificates if applicable.
 - 8. Review temporary protection requirements for roofing system during and after installation.
 - 9. Review roof observation and repair procedures after roofing installation.
- G. **Preinstallation Roofing Conference:** Conduct conference at Project site.
 - 1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.

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2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.
- B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
 1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.
- C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.
- D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

1.9 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.10 WARRANTY

- A. Special Warranty: Manufacturer's standard or customized form, without monetary limitation, in which manufacturer agrees to repair or replace components of membrane roofing system that fail in materials or workmanship within specified warranty period.
 1. Total System Warranty includes membrane roofing, base flashings, roof insulation, fasteners, cover boards, substrate board, roofing accessories including roof pavers, and other components of membrane roofing system.
 2. Warranty Period: 20 years from date of Substantial Completion.

- B. Special Project Warranty: Submit roofing Installer's warranty, on warranty form at end of this Section, signed by Installer, covering the Work of this Section, including all components of membrane roofing system such as membrane roofing, base flashing, roof insulation, fasteners, cover boards, substrate boards, roof pavers, and walkway products, for the following warranty period:
1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 TPO MEMBRANE ROOFING (SINGLE PLY)

- A. Basis of Design: Sure-Weld TPO, fabric-reinforced thermoplastic polyolefin sheet: ASTM D 6878, internally fabric or scrim reinforced, uniform, flexible fabric backed TPO sheet as manufactured by Carlisle SynTec Incorporated, or subject to compliance with requirements, provide products by one of the following:
1. Carlisle SynTec Incorporated.
 2. Firestone Building Products Company.
 3. GAF Materials Corporation.
 4. Stevens Roofing Systems; Division of JPS Elastomerics.
- B. Properties:
1. Thickness: 72 mils (1.8 mm), nominal.
 2. Exposed Face Color: White.

2.2 AUXILIARY MEMBRANE ROOFING MATERIALS

- A. General: Auxiliary membrane roofing materials recommended by roofing system manufacturer for intended use, and compatible with membrane roofing.
1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.
 2. Adhesives and sealants that are not on the exterior side of weather barrier shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - a. Plastic Foam Adhesives: 50 g/L.
 - b. Gypsum Board and Panel Adhesives: 50 g/L.
 - c. Multipurpose Construction Adhesives: 70 g/L.
 - d. Fiberglass Adhesives: 80 g/L.
 - e. Contact Adhesive: 80 g/L.
 - f. Other Adhesives: 250 g/L.
 - g. Single-Ply Roof Membrane Sealants: 450 g/L.
 - h. Nonmembrane Roof Sealants: 300 g/L.
 - i. Sealant Primers for Nonporous Substrates: 250 g/L.
 - j. Sealant Primers for Porous Substrates: 775 g/L.

- B. Sheet Flashing: Manufacturer's standard unreinforced thermoplastic polyolefin sheet flashing, **55 mils (1.4 mm)** thick, minimum, of same color as sheet membrane.
- 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 (25 by 3 mm)** 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 (25 mm wide by 1.3 mm thick)**, prepunched.
- G. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening membrane to substrate, and acceptable to membrane 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.

2.3 SUBSTRATE BOARDS

- A. Substrate Board: ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum substrate, Type X, **1/4 inch (6 mm)** thick.
 - 1. Products: Subject to compliance with requirements, provide the following:
 - a. Georgia-Pacific Corporation; Dens Deck.
- B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening substrate board to roof deck.

2.4 ROOF INSULATION

- A. General: Preformed roof insulation boards manufactured or approved by TPO membrane roofing manufacturer, selected from manufacturer's standard sizes suitable for application, of thicknesses indicated.
- B. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class 1, Grade 2, felt or glass-fiber mat facer on both major surfaces.
- C. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of **1/4 inch per 12 inches (1:48)** unless otherwise indicated.
- D. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

2.5 INSULATION ACCESSORIES

- A. General: Furnish roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with membrane roofing.

- B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation and cover boards to substrate, and acceptable to roofing system manufacturer.
- C. Full-Spread Applied Insulation Adhesive: Insulation manufacturer's recommended spray-applied, low-rise, two-component urethane adhesive formulated to attach roof insulation to substrate or to another insulation layer.
- D. Cover Board: ASTM C 208, Type II, Grade 2, cellulosic-fiber insulation board, 1/2 inch (13 mm) thick.

2.6 WALKWAYS

- A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, slip-resisting, surface-textured walkway pads, approximately 3/16 inch (5 mm) thick, and acceptable to membrane roofing system manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:
 - 1. Verify that roof openings and penetrations are in place and curbs are set and braced and that roof drain bodies are securely clamped in place.
 - 2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
 - 3. Verify that surface plane flatness and fastening of steel roof deck complies with requirements in Division 5 Section "Steel Deck."
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.
- B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.
- C. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

3.3 SUBSTRATE BOARD

- A. Install substrate board with long joints in continuous straight lines, perpendicular to roof slopes with end joints staggered between rows. Tightly butt substrate boards together.
 - 1. Fasten substrate board to top flanges of steel deck to resist uplift pressure at corners, perimeter, and field of roof according to membrane roofing system manufacturers' written instructions.

3.4 INSULATION INSTALLATION

- A. Coordinate installing membrane roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.
- B. Comply with membrane roofing system and insulation manufacturer's written instructions for installing roof insulation.
- C. Install tapered insulation under area of roofing to conform to slopes indicated.
- D. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is **2.7 inches (68 mm)** or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of **6 inches (150 mm)** in each direction.
 - 1. Where installing composite and noncomposite insulation in two or more layers, install noncomposite board insulation for bottom layer and intermediate layers, if applicable, and install composite board insulation for top layer.
- E. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.
- F. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding **1/4 inch (6 mm)** with insulation.
 - 1. Cut and fit insulation within **1/4 inch (6 mm)** of nailers, projections, and penetrations.
- G. Adhered Insulation: Install each layer of insulation and adhere to substrate as follows:
 - 1. Prime surface of concrete deck with asphalt primer at rate of 3/4 gal./100 sq. ft. (0.3 L/sq. m) and allow primer to dry.
 - 2. Set each layer of insulation in a solid mopping of hot roofing asphalt, applied within plus or minus 25 deg F (14 deg C) of equiviscous temperature.
 - 3. Set each layer of insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.
 - 4. Set each layer of insulation in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.
- H. Mechanically Fastened Insulation: Install each layer of insulation and secure to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.
 - 1. Fasten insulation to resist uplift pressure at corners, perimeter, and field of roof.

- I. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of **6 inches (150 mm)** in each direction. Loosely butt cover boards together.
 - 1. Fasten cover boards according to requirements in FM Approvals' "RoofNav" for specified Windstorm Resistance Classification.
 - 2. Fasten cover boards to resist uplift pressure at corners, perimeter, and field of roof.
- J. Install slip sheet over cover board and immediately beneath membrane roofing.

3.5 ADHERED MEMBRANE ROOFING INSTALLATION

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

3.6 MECHANICALLY FASTENED MEMBRANE ROOFING INSTALLATION

- A. Mechanically fasten membrane roofing over area to receive roofing and install according to roofing system manufacturer's written instructions.
 - 1. For in-splice attachment, install membranes roofing with long dimension perpendicular to steel roof deck flutes.
- B. Start installation of membrane roofing in presence of roofing system manufacturer's technical personnel.

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- C. Accurately align membrane roofing and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
- D. Mechanically fasten or adhere membrane roofing securely at terminations, penetrations, and perimeter of roofing.
- E. Apply membrane roofing with side laps shingled with slope of roof deck where possible.
- F. In-Seam Attachment: Secure one edge of TPO sheet using fastening plates or metal battens centered within membrane seam and mechanically fasten TPO sheet to roof deck.
- G. Seams: Clean seam areas, overlap membrane roofing, and hot-air weld side and end laps of membrane roofing and sheet flashings according to manufacturer's written instructions to ensure a watertight seam installation.
 - 1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of sheet membrane.
 - 2. Verify field strength of seams a minimum of twice daily and repair seam sample areas.
 - 3. Repair tears, voids, and lapped seams in roofing that does not comply with requirements.
- H. Spread sealant bed over deck drain flange at roof drains and securely seal membrane roofing in place with clamping ring.

3.7 BASE FLASHING INSTALLATION

- A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.
- B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply to seam area of flashing.
- C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.
- D. Clean 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.

3.8 WALKWAY INSTALLATION

- A. Flexible Walkways: Install walkway products in locations indicated. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.
- B. Roof-Paver Walkways: Install walkway roof pavers according to manufacturer's written instructions in locations indicated, to form walkways. Leave **3 inches (75 mm)** of space between adjacent roof pavers.

3.9 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.
- C. Repair or remove and replace components of membrane roofing system where inspections indicate that they do not comply with specified requirements.
- D. Additional inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.10 PROTECTING AND CLEANING

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

3.11 ROOFING INSTALLER'S WARRANTY

- A. WHEREAS <Insert name> of <Insert address>, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:
 - 1. Owner: <Insert name of Owner>.
 - 2. Address: <Insert address>.
 - 3. Building Name/Type: <Insert information>.
 - 4. Address: <Insert address>.
 - 5. Area of Work: <Insert information>.
 - 6. Acceptance Date: <Insert date>.
 - 7. Warranty Period: <Insert time>.
 - 8. Expiration Date: <Insert date>.
- B. AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period,

- C. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period he will, at his own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work and as are necessary to maintain said work in a watertight condition.
- D. This Warranty is made subject to the following terms and conditions:
1. Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:
 - a. Lightning;
 - b. Peak gust wind speed exceeding <Insert wind speed> mph (m/sec);
 - c. Fire;
 - d. Failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
 - e. Faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
 - f. Vapor condensation on bottom of roofing; and
 - g. Activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.
 2. When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof have been paid by Owner or by another responsible party so designated.
 3. Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of work.
 4. During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of said alterations, but only to the extent said alterations affect work covered by this Warranty. If Owner engages Roofing Installer to perform said alterations, Warranty shall not become null and void unless Roofing Installer, before starting said work, shall have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this Warranty.
 5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray-cooled surface, flooded basin, or other use or service more severe than originally specified, this Warranty shall become null and void on date of said change, but only to the extent said change affects work covered by this Warranty.
 6. Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect work and to examine evidence of such leaks, defects, or deterioration.
 7. This Warranty is recognized to be the only warranty of Roofing Installer on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of original work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

- E. IN WITNESS THEREOF, this instrument has been duly executed this <Insert day> day of <Insert month>, <Insert year>.
1. Authorized Signature: <Insert signature>.
 2. Name: <Insert name>.
 3. Title: <Insert title>.

- END OF SECTION -

- SECTION 07 6200 -**SHEET METAL FLASHING AND TRIM**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. This Section includes sheet metal flashing and trim in the following categories:
 - 1. Metal flashing.
 - 2. Reglets.
 - 3. Overhead-piping safety pans.
 - 4. Counterflashings over bituminous base flashing.
 - 5. Counterflashings at roof mounted equipment and vent stacks.
 - 6. Counterflashings at walls and penetrations.
 - 7. Lead flashing for bituminous membranes.
 - 8. Other components.

1.3 RELATED SECTIONS

- A. Section 01 74 19 "Materials Recycling & Waste Management".
- B. Section 01 81 13 "LEED Certification Requirements".
- C. Section 07 4215 "Glass Façade Panel System" for sheet metal flashing and trim integral with glass façade panel system.
- D. Section 07 4219 "Metal Plate Wall Panels" for sheet metal flashing and trim integral with metal wall panels.
- E. Section 07 5400 "Thermoplastic Membrane (TPO) Roofing" to be installed in conjunction with roofing system by same installer and warranty.
- F. Section 07 7129 "Manufactured Roof Expansion Joints" manufactured sheet metal expansion-joint covers.
- G. Section 07 7200 "Roof Accessories" for set-on-type curbs, equipment supports, roof hatches, vents, and other manufactured roof accessory units.

- H. Section 07 9200 "Joint Sealants" for elastomeric sealants.
- I. Section 07 9500 "Expansion Control" for manufactured sheet metal expansion-joint covers.

1.4 REFERENCES

ASTM A-446	Specification for steel sheet
ASTM A792	Steel Sheet, Aluminum-Zinc Alloy-Coated, by the Hot-Dip Process
ASTM B32	Solder Metal
ASTM B486	Paste Solder
ASTM D226	Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing
ASTM D486	Asphalt Roof Cement, Asbestos-free
FS O-F-506	Flux, Soldering, Paste and Liquid
WH	Warnock Hersey International, Inc. Middleton, WI.
FM	Loss Prevention Data Sheet
NRCA	National Roofing Contractors Association - Roofing Manual
SMACNA	Architectural Sheet Metal Manual

1.5 PERFORMANCE REQUIREMENTS

- A. General: Install sheet metal flashing and trim to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failing.
- B. Fabricate and install flashings at roof edges to comply with recommendations of FM Loss Prevention Data Sheet 1-49 for the following wind zone:
 - 1. Wind Zone 1: Wind pressures of **21 to 30 psf (1.00 to 1.44 kPa)**.

1.6 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Specification Section 01 3219.
- B. Product Data including manufacturer's material and finish data, installation instructions, and general recommendations for each specified flashing material and fabricated product.
 - 1. Metal material characteristics and installation recommendations.
 - 2. Submit color chart prior to material ordering and/or fabrication so that equivalent colors to those specific can be approved
 - 3. Provide approval letters from metal manufacturer for use of their metal within this particular roofing system type.
- C. LEED Submittal: See Section 018113 LEED Certification Requirements for the following:
 - 1. MRc4 Recycled Content: Product data for products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content.
 - a. Include cost information for each product having recycled content.
 - 2. MRc5 Regional Materials:
 - a. Sourcing location(s): indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery from the project site.

- b. Manufacturing location(s): indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
 - c. Product Value: indicate dollar value of product containing regional materials; include materials costs only.
 - d. Product Component(s) Value: Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.
3. MRc7 Certified Wood: Provide Chain-of-custody certificates that products specified to be made from certified wood comply with forest certification requirements. Include evidence that mill is certified for chain-of-custody by FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship".
- a. Include cost information for each certified wood product.
4. EQc4.1 Adhesives & Sealants: Product data for adhesives & sealants, including printed statement of VOC content and chemical components.
- D. Shop Drawings of each item specified showing layout, profiles, methods of joining, and anchorage details.
- 1. For manufactured and shop fabricated edge metal, fascia, scuppers, and all other sheet metal fabrications.
 - 2. Indicate material profile, jointing pattern, jointing details, fastening methods, flashing, termination's, and installation details.
 - 3. Indicate type, gauge and finish of metal.
- E. Certification
- 1. Submit roof manufacturer's certification that metal fasteners furnished are acceptable to roof manufacturer.
 - 2. Submit roof manufacturer's certification that metal furnished is acceptable to roofing manufacturer as a component of roofing system and is eligible for roof manufacturer's system warranty.
- F. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer who has completed sheet metal flashing and trim work similar in material, design, and extent to that indicated for this Project and with a minimum 5 year fabrication and installation record of successful in-service performance.
- B. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" unless more stringent requirements are specified or shown on Drawings.
- C. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

- D. Preinstallation Conference: Conduct conference at Project site.
 - 1. Meet with Owner, Architect, Owner's insurer if applicable, Installer, and installers whose work interfaces with or affects sheet metal flashing and trim including installers of roofing materials, roof accessories, and roof-mounted equipment.
 - 2. Review methods and procedures related to sheet metal flashing and trim.
 - 3. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
 - 4. Review special roof details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect sheet metal flashing.
 - 5. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's original, unopened containers or packages with labels intact and legible.
- B. Stack performed and pre-finished material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
- C. Prevent contact with materials which may cause discoloration or staining.

1.9 WARRANTY

- A. Manufacturer's Warranty
 - 1. Pre-finished metal material shall require a written 20-year non-prorated warranty covering fade, chalking and film integrity. The material shall not show a color change greater than 5 NBS color units per ASTM D-2244 or chalking excess of 8 units per ASTM D-659. If either occurs material shall be replaced per warranty, at no cost to the Owner.
- B. Contractor's Warranty
 - 1. The Contractor shall provide the Owner with a notarized written warranty assuring that all sheet metal work including caulking and fasteners to be water-tight and secure for a period of five years from the date of final acceptance of the building. Warranty shall include all materials and workmanship required to repair any leaks that develop, and make good any damage to other work or equipment caused by such leaks or the repairs thereof.

1.10 PROJECT CONDITIONS

- A. Coordinate Work of this Section with interfacing and adjoining Work for proper sequencing of each installation. Ensure best possible weather resistance, durability of Work, and protection of materials and finishes.

PART 2 - PRODUCTS

2.1 METALS

- A. Aluminum Sheet: **ASTM B 209 (ASTM B 209M)**, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required.
1. As-Milled Finish: Mill finish.
 2. Alclad Finish: Metallurgically bonded surfacing to both sides, forming a composite aluminum sheet with reflective luster.
 3. Surface: Smooth, flat.
 4. Factory Prime Coating: Where painting after installation is indicated, pretreat with white or light-colored, factory-applied, baked-on epoxy primer coat; minimum dry film thickness of **0.2 mil (0.005 mm)**.
 5. Exposed Coil-Coated Finishes:
 - a. Two-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - b. Color: As selected by Architect from manufacturer's full range.
 6. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of **0.5 mil (0.013 mm)**.
- B. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304, dead soft, fully annealed.
- C. Galvanized Steel Sheet: ASTM A 526, G 90 (**ASTM A 526M, Z 275**), commercial quality, or ASTM A 527, G 90 (**ASTM A 527M, Z 275**), lock-forming quality, hot-dip galvanized steel sheet with 0.20 percent copper, mill phosphatized where indicated for painting; not less than 0.0396 inch (**1.0 mm**) thick, unless otherwise indicated.
- D. Coil-Coated Galvanized Steel Sheet: Zinc-coated, commercial-quality steel sheet conforming to ASTM A 755, G 90 (**ASTM A 755M, Z 275**) coating designation, coil coated with high-performance fluoropolymer coating as specified in "Coil-Coated Galvanized Steel Sheet Finish" Article; not less than 0.0336 inch (**0.85 mm**) thick, unless otherwise indicated.

2.2 UNDERLAYMENT MATERIALS

- A. Self-Adhering, High-Temperature Sheet: Minimum **30 to 40 mils (0.76 to 1.0 mm)** thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.
1. Thermal Stability: ASTM D 1970; stable after testing at **240 deg F (116 deg C)**.
 2. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus **20 deg F (29 deg C)**.
 3. Products: Subject to compliance with requirements, provide the following:
 - a. Grace Construction Products, a unit of W. R. Grace & Co.; Ultra.

- B. Self-Adhering, Polyethylene-Faced Sheet: ASTM D 1970, 40 mils (1.0 mm) thick minimum, consisting of slip-resisting polyethylene-film reinforcing and top surface laminated to SBS-modified asphalt adhesive, with release-paper backing; cold applied.
 - 1. Subject to compliance with requirements, provide the following:
 - a. Grace, W. R. & Co.; Grace Ice and Water Shield.
- C. Flexible Flashings: Self-adhesive, self-sealing SBS modified asphalt waterproof membrane laminated to high density, cross-laminated polyethylene film reinforcement to produce an overall thickness of not less than 0.025 inch (0.6 mm) and 0.040 inch (1.0 mm) where indicated.
 - 1. Products: Subject to compliance with requirements, provide the following
 - a. Fortifiber Building Systems Group; Fortiflash 25 and Fortiflash 40.
- D. Primer for Flexible Flashing: Product recommended by manufacturer of flexible flashing for substrate.

2.3 REGLETS

- A. General: Units of type, material, and profile indicated, formed to provide secure interlocking of separate reglet and counterflashing pieces and compatible with flashing indicated.
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
 - a. Cheney Flashing Company, Inc.
 - b. Fry Reglet Corporation.
 - c. Heckmann Building Products Inc.
 - d. Hickman, W. P. Company.
 - e. Keystone Flashing Company, Inc.
 - f. Sandell Manufacturing Company, Inc.
- B. Material: Galvanized steel, 0.0217 inch (0.55 mm) thick.
- C. Stucco Type: Provide with minimum 3 inch upturned fastening flange and extension leg of length to match thickness of applied finish materials.
- D. Flexible Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where Drawings show reglet without metal counterflashing.
 - 1. Product: Vinylok Flashing Retainer manufactured by Fry Reglet Corporation.
- E. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of the counterflashing lower edge.
 - 1. Material: Stainless steel, 0.0187 inch (0.5 mm) thick.
 - 2. Material: Copper, 16 oz./sq. ft. (0.55 mm thick).
 - 3. Material: Aluminum, 0.024 inch (0.6 mm) thick.
 - 4. Material: Galvanized steel, 0.0217 inch (0.55 mm) thick.

- F. Concrete Type: Provide temporary closure tape to keep reglet free of concrete materials, special fasteners for attaching reglet to concrete forms, and guides to ensure alignment of reglet section ends.

2.4 MISCELLANEOUS MATERIALS AND ACCESSORIES

- A. Solder: ASTM B 32, Grade Sn50, used with rosin flux.
- B. Fasteners: Same metal as sheet metal flashing or other noncorrosive metal as recommended by sheet metal manufacturer. Match finish of exposed heads with material being fastened.
- C. Elastomeric Sealant: ASTM C 920, Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 50, for Use NT.
 - 1. Dow Corning 791 Silicone Weatherproofing Sealant or equal.
- D. Epoxy Seam Sealer: 2-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior and interior nonmoving joints, including riveted joints.
- E. Adhesives: Type recommended by flashing sheet metal manufacturer for waterproof and weather-resistant seaming and adhesive application of flashing sheet metal.
- F. Polyethylene Underlayment: ASTM D 4397, minimum 6-mil- (0.15-mm-) thick black polyethylene film, resistant to decay when tested according to ASTM E 154.
- G. Metal Accessories: Provide sheet metal clips, straps, anchoring devices, and similar accessory units as required for installation of Work, matching or compatible with material being installed; noncorrosive; size and thickness required for performance.

2.5 FABRICATION, GENERAL

- A. Sheet Metal Fabrication Standard: Fabricate sheet metal flashing and trim to comply with recommendations of SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of the item indicated.
- B. Comply with details shown to fabricate sheet metal flashing and trim that fit substrates and result in waterproof and weather-resistant performance once installed. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
- C. Form exposed sheet metal Work that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems.
- D. Seams: Fabricate nonmoving seams in sheet metal with flat-lock seams. Tin edges to be seamed, form seams, and solder.
- E. Size: As recommended by SMACNA manual or sheet metal manufacturer for application but never less than thickness of metal being secured.

2.6 SHEET METAL FABRICATIONS

- A. General: Fabricate sheet metal items in thickness or weight needed to comply with performance requirements but not less than that listed below for each application and metal.
- B. Equipment Support Flashing: Fabricate from the following material:
 - 1. Galvanized Steel: 0.0276 inch (0.7 mm) thick.
 - 2. Coil-Coated Galvanized Steel: 0.0276 inch (0.7 mm) thick.
- C. Overhead-Piping Safety Pans: Fabricate from the following material:
 - 1. Galvanized Steel: 0.0396 inch (1.0 mm) thick.

2.7 COIL-COATED GALVANIZED STEEL SHEET FINISH

- A. Exposed Coil-Coated Finish:
 - 1. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions. Color and Gloss: Alabaster by PPG.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions under which sheet metal flashing and trim are to be installed and verify that Work may properly commence. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PROTECTION

- A. Protect contact areas of dissimilar metals with heavy asphalt or other approved coating, specifically made to stop electrolytic action.

3.3 MANUFACTURED SHEET METAL SYSTEMS

- A. Installing Contractor shall be responsible for determining if the sheet metal systems are in general conformance with roof manufacturer's recommendations.
- B. Furnish and install manufactured sheet metal systems in strict accordance with manufacturer's printed instructions.
- C. Provide all factory-fabricated accessories including, but not limited to, fascia extenders, miters, scuppers, joint covers, etc

3.4 SHOP FABRICATED SHEET METAL SYSTEMS

- A. Installing Contractor shall be responsible for determining if the sheet metal systems are in general conformance with roof manufacturer's recommendations.
- B. Metal work shall be shop fabricated to configurations and forms in accordance with recognized sheet metal practices.
- C. Hem exposed edges.
- D. Angle bottom edges of exposed vertical surfaces to form drip.
- E. All corners for sheet metal shall be lapped with adjoining pieces fastened and set in sealant.
- F. Joints for fascia system, cap flashing, and surface-mount counterflashing shall be formed with a 1/4" opening between sections. The opening shall be covered by a cover plate or backed by an internal drainage plate formed to the profile of fascia piece. The cover plate shall be embedded in mastic, fastened through the opening between the sections and loose locked to the drip edges.

3.5 UNDERLAYMENT INSTALLATION

- A. Refer to Section 06 1600 "Sheathing" for building paper installation.
- B. General: Install underlayment as indicated on Drawings.
- C. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free. Apply primer if required by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer rather than nails for installing underlayment at low temperatures. Apply in shingle fashion to shed water, with end laps of not less than 6 inches (150 mm) staggered 24 inches (600 mm) between courses. Overlap side edges not less than 3-1/2 inches (90 mm). Roll laps with roller. Cover underlayment within 14 days.

3.6 INSTALLATION, GENERAL

- A. Unless otherwise indicated, install sheet metal flashing and trim to comply with performance requirements, manufacturer's installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Anchor units of Work securely in place by methods indicated, providing for thermal expansion of metal units; conceal 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 weatherproof.
- B. Install exposed sheet metal Work that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
- C. Expansion Provisions: Provide for thermal expansion of exposed sheet metal Work. Space movement joints at maximum of 10 feet (3 m) with no joints allowed within 24 inches (610 mm) of corner or intersection. Where lapped or bayonet-type expansion provisions in Work cannot

be used or would not be sufficiently weatherproof and waterproof, form expansion joints of intermeshing hooked flanges, not less than **1 inch (25 mm)** deep, filled with mastic sealant (concealed within joints).

- D. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate elastomeric sealant to comply with SMACNA standards. Fill joint with sealant and form metal to completely conceal sealant.
 - 1. Use joint adhesive for nonmoving joints specified not to be soldered.
- E. Seams: Fabricate nonmoving seams in sheet metal with flat-lock seams. Tin edges to be seamed, form seams, and solder.
- F. Separations: Separate metal from noncompatible metal or corrosive substrates by coating concealed surfaces, at locations of contact, with asphalt mastic or other permanent separation as recommended by manufacturer.
 - 1. Underlayment: Where installing stainless steel or aluminum directly on cementitious or wood substrates, install a slip sheet of red-rosin paper and a course of polyethylene underlayment.
 - 2. Bed flanges of Work in a thick coat of roofing cement where required for waterproof performance.
- G. Install reglets to receive counterflashing according to the following requirements:
 - 1. Where reglets are shown in concrete, furnish reglets for installation under Division 3 Section "Cast-in-Place Concrete."
- H. Counterflashings: Coordinate installation of counterflashings with installation of assemblies to be protected by counterflashing. Install counterflashings in reglets or receivers. Secure in a waterproof manner by means of snap-in installation and sealant, lead wedges and sealant, interlocking folded seam, or blind rivets and sealant. Lap counterflashing joints a minimum of **2 inches (50 mm)** and bed with sealant.
- I. Fascia: Metal fascia and copings shall be secured to wood nailers at the bottom edge with a continuous cleat. Cleats shall be at least one gauge heavier than the metal it secures
- J. Roof-Drainage System: Install drainage items fabricated from sheet metal, with straps, adhesives, and anchors recommended by SMACNA's Manual or the item manufacturer, to drain roof in the most efficient manner. Coordinate roof-drain flashing installation with roof-drainage system installation. Coordinate flashing and sheet metal items for steep-sloped roofs with roofing installation.
- K. Overhead-Piping Safety Pans: Suspend pans from pipe and install drain line to plumbing waste or drain line.
- L. Equipment Support Flashing: Coordinate equipment support flashing installation with roofing and equipment installation. Weld or seal flashing to equipment support member.
- M. Roof-Penetration Flashing: Coordinate roof-penetration flashing installation with roofing and installation of items penetrating roof. Install flashing as follows:

3.7 FLEXIBLE FLASHING INSTALLATION

- A. Apply flexible flashing where indicated to comply with manufacturer's written instructions.
 - 1. Prime substrates as recommended by flashing manufacturer.
 - 2. Lap seams and junctures with other materials at least **4 inches (100 mm)** except that at flashing flanges of other construction, laps need not exceed flange width.
 - 3. Lap flashing over water-resistive barrier at bottom and sides of openings.
 - 4. Lap water-resistive barrier over flashing at heads of openings.
- B. After flashing has been applied, roll surfaces with a hard rubber or metal roller to ensure that flashing is completely adhered to substrates.

3.8 INSPECTION

- A. Verify roof openings, curbs, pipes, sleeves, ducts, or vents through roof are solidly set, cant strips and reglets are in place, and nailing strips located.
- B. Verify membrane termination and base flashings are in place, sealed, and secure.
- C. Beginning of installation means acceptance of existing conditions.
- D. Field measure site conditions prior to fabricating work.

3.9 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces, removing substances that might cause corrosion of metal or deterioration of finishes.
- B. Provide final protection and maintain conditions that ensure sheet metal flashing and trim Work during construction is without damage or deterioration other than natural weathering at the time of Substantial Completion

- END OF SECTION -

- SECTION 07 7129 -

MANUFACTURED ROOF EXPANSION JOINTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Aluminum roof expansion assemblies.

1.3 RELATED SECTIONS

- A. Section 01 74 19 "Materials Recycling & Waste Management".
- B. Section 01 81 13 "LEED Certification Requirements".
- C. Section 06 1053 "Miscellaneous Rough Carpentry" for wooden curbs for mounting roof expansion assemblies.
- D. Section 07 5400 "Thermoplastic Membrane (TPO) Roofing" for coordination with single ply membrane roofing system.
- E. Section 07 6200 "Sheet Metal Flashing and Trim" for shop and field-fabricated sheet metal expansion-joint systems, flashing, and other sheet metal items.
- F. Section 07 9500 "Expansion Control" for building exterior and interior expansion joint systems.

1.4 PERFORMANCE REQUIREMENTS

- A. General: Provide roof expansion assemblies that, when installed, remain watertight within movement limitations specified by manufacturer.

1.5 SUBMITTALS

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

- B. LEED Submittal: See Section 018113 LEED Certification Requirements for the following:
1. MRc4 Recycled Content: Product data for products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content.
 - a. Include cost information for each product having recycled content.
 2. MRc5 Regional Materials:
 - a. Sourcing location(s): indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery from the project site.
 - b. Manufacturing location(s): indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
 - c. Product Value: indicate dollar value of product containing regional materials; include materials costs only.
 - d. Product Component(s) Value: Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.
 3. EQc4.1 Adhesives & Sealants: Product data for adhesives & sealants, including printed statement of VOC content and chemical components.
- C. Shop Drawings: Include plans, elevations, sections, details, joints, splices, locations of joints and splices, intersections, transitions, fittings, and attachments to other work. Where joint assemblies change planes, provide isometric drawings depicting how components interconnect to achieve continuity.
- D. Samples: For each type of exposed factory-applied finish required, prepared on Samples of size to adequately show color.
- E. Research/Evaluation Reports: For roof expansion assemblies.
- F. Warranties: Special warranties specified in this Section.
- G. Qualification Data: For Installer.

1.6 QUALITY ASSURANCE

- A. Product Options: Drawings indicate size, profiles, and dimensional requirements of roof expansion assemblies and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."
1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

1.7 SCHEDULING

- A. Coordinate delivery and installation of roof expansion assemblies to prevent damage and provide timely integration of units with roofing membranes and flashing.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer and Installer agree to repair or replace roof expansion assemblies that leak, deteriorate in excess of rates specified in manufacturer's published product literature, or otherwise fail to perform within specified warranty period.
1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

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

2.2 METALS

- A. Stainless-Steel Sheet: ASTM A 666, Type 304, stretcher-leveled standard of flatness, minimum 0.015 inch (0.4 mm) thick.
- B. Sheet Aluminum: ASTM B 209 (ASTM B 209M); Alloy 3003-H14, 5052-H32, or 6061-T6; minimum 0.032 inch (0.8 mm) thick.
- C. Extruded Aluminum: ASTM B 221 (ASTM B 221M), Alloy 6063-T5 or 6063-T52, minimum 0.040 inch (1.0 mm) thick.
- D. Aluminum Finishes:
1. High-Performance Organic Finish (2-Coat Fluoropolymer): AA-C12C40R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: conversion coating; Organic Coating: manufacturer's standard 2-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with AAMA 2604 and with coating and resin manufacturers' written instructions.
 - a. Color and Gloss: As selected by Architect from manufacturer's full range.

2.3 MISCELLANEOUS MATERIALS

- A. Roof Cement: ASTM D 4586, Type II.
- B. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and to remain watertight.
- C. Flexible Cellular Sponge or Expanded Rubber: ASTM D 1056.

- D. Silicone Extrusions: Classified according to ASTM D 2000, UV stabilized, and do not propagate flame.
- E. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to withstand design loads.

2.4 ALUMINUM ROOF EXPANSION ASSEMBLIES

- A. Aluminum Roof Expansion Assemblies: Provide assemblies consisting of aluminum base members with sloped cants and provisions for anchoring and sealing to roofing membrane or flashing in a waterproof-sealed joint. Provide free-to-move, extruded-aluminum cover plate anchored against displacement and waterproofed by integral seals. Provide prefabricated units for corner and joint intersections and horizontal and vertical transitions, including those to other building expansion joints, splicing units, adhesives, coatings, and other components as recommended by roof expansion assembly manufacturer for complete installation. Fabricate assemblies specifically for curb-to-curb and curb-to-wall applications.
 - 1. Basis-of-Design Product: The design based on Model 661-A02-250 as manufactured by In-Pro Corporation. or subject to compliance with requirements, provide the named product or a comparable product by one of the following manufacturers
 - a. Balco Metalines, a division of Balco, Inc..
 - b. C/S Group; Model.
 - c. Hickman, W. P. Company;
 - d. JointMaster, a division of InPro Corporation.
 - e. MM Systems Corporation.
 - f. Nystrom, Inc.
 - 2. Base Frame Members: Extruded aluminum with high-performance organic finish.
 - 3. Formed-Aluminum Covers: Minimum **0.078 inch (2 mm)** thick, with high-performance organic finish.
 - a. Aluminum Seismic Roof Cover Assembly: Roof-to-roof and roof-to-wall aluminum covers held in place by stainless steel seismic turnbar assembly 24" o.c. for max. 16" joint width. Joint system to be capable of plus and minus 7" seismic movement.
 - b. Frames to incorporate adjustable angle flange folded on site to cover adjacent edge of roof membrane. All transitions and end caps to be factory fabricated to ensure maximum weather tightness. All butt joints to be sealed with aluminum splice cover bedded on caulk and fastened on one side only.
 - 4. Moisture Barrier: Semiconcealed, captive gaskets at both curb members, of neoprene, EPDM, or PVC, with spring-loaded mechanism to maintain positive pressure between gaskets and curb cap.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with manufacturer's written instructions for handling and installing roof expansion assemblies and materials unless more stringent requirements are indicated.

MANUFACTURED ROOF EXPANSION JOINTS

- B. Coordinate installation of roof expansion assembly materials and associated work so complete assemblies comply with assembly performance requirements.
- C. Extend roof expansion assemblies over curbs, and other elements in the construction profile, with factory-fabricated intersections and transitions to provide continuous, uninterrupted, waterproof roof expansion assemblies.
 - 1. Install factory-fabricated transitions between roof expansion assemblies and building architectural joint systems, specified in Division 7 Section "Expansion Control," to provide continuous, uninterrupted, watertight construction.
- D. Splice roof expansion assemblies with materials provided by roof expansion assembly manufacturer for this purpose, according to manufacturer's written instructions, to provide continuous, uninterrupted, waterproof roof expansion assemblies.
- E. Provide uniform profile of roof expansion assembly throughout length of each installation; do not stretch polymeric sheets.
- F. Anchor roof expansion assemblies complying with manufacturer's written instructions.
- G. On single-ply roofing, install roof expansion assemblies complying with manufacturer's written instructions. Anchor to cants or curbs and seal to membrane with sealant compatible with roofing membrane and roof expansion assembly.

3.2 PROTECTION

- A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensures that roof expansion assemblies are without damage or deterioration at time of Substantial Completion.

- END OF SECTION -

- SECTION 07 7200 -

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. This Section includes the following:
 - 1. Pre-manufactured Roof Hatches, safety posts and safety railings.

1.3 RELATED WORK

- A. Section 01 74 19 "Materials Recycling & Waste Management".
- B. Section 01 81 13 "LEED Certification Requirements".
- C. Section 05 1200 "Structural Steel Framing".
- D. Section 05 5000 "Metal Fabrication" for ships' ladder for access to roof hatch.
- E. Section 07 5400 "Thermoplastic Membrane (TPO) Roofing" for roofing systems and conditions.
- F. Section 07 6200 "Sheet Metal Flashing and Trim" for required flashing at roof.
- G. Section 09 9113 "Exterior Painting" for painting unfinished roof flashing and roof accessories.
- H. Division 23 "Mechanical" to coordinate sizes of pre-manufactured roof curbs.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, materials, dimensions of individual components and profiles, and finishes.
- B. LEED Submittal: See Section 018113 LEED Certification Requirements for the following:
 - 1. MRc4 Recycled Content: Product data for products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content.
 - a. Include cost information for each product having recycled content.

2. MRc5 Regional Materials:
 - a. Sourcing location(s): indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery from the project site.
 - b. Manufacturing location(s): indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
 - c. Product Value: indicate dollar value of product containing regional materials; include materials costs only.
 - d. Product Component(s) Value: Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.
 3. MRc7 Certified Wood: Provide Chain-of-custody certificates that products specified to be made from certified wood comply with forest certification requirements. Include evidence that mill is certified for chain-of-custody by FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship".
 - a. Include cost information for each certified wood product.
 4. EQc4.1 Adhesives & Sealants: Product data for adhesives & sealants, including printed statement of VOC content and chemical components.
 5. EQc4.2 Paints & Coatings: Product data for paints & coatings, including printed statement of VOC content and chemical components.
- C. Shop Drawings for Prefabricated Curbs: Show fabrication and installation details. Indicate dimensions, weights, loadings, required clearances, method of field assembly, and components. Include plans, elevations, sections, details, and attachments to other Work.

1.5 QUALITY ASSURANCE

- A. Standards: Comply with the following:
1. SMACNA's "Architectural Sheet Metal Manual" details for fabrication of units, including flanges and cap flashing to coordinate with type of roofing indicated.
 2. NRCA's "Roofing and Waterproofing Manual" details for installing units.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Roof Hatches:
 - a. MATERIALS Basis-of-Design Product: The design is based on Type NB Roof Scuttle manufactured by The Bilco Company, New Haven, CT, tel: (203) 934-6363, web: www.bilco.com.
 - b. Subject to compliance with requirements, provide the named product or a comparable product by one of the following manufactures:
 - 1) O'Keeffe's Inc.
 - 2) Dur-Red Products, Inc.

ROOF ACCESSORIES

- 3) Milcor, Inc.
- 4) ThyCurb, Inc,

2.2 MATERIALS, GENERAL

- A. Aluminum Sheet: ASTM B 209 for alclad alloy 3005H25 or alloy and temper required to suit forming operations, with mill finish, unless otherwise indicated.
- B. Extruded Aluminum: ASTM B 221 alloy 6063-T52 or alloy and temper required to suit structural and finish requirements, with mill finish, unless otherwise indicated.
- C. Galvanized Steel Sheet: ASTM A 653 with G90 coating designation; commercial quality, unless otherwise indicated.
 1. Structural Quality: Grade 40, where indicated or as required for strength.
- D. Insulation: Manufacturer's standard rigid or semirigid glass-fiber board of thickness indicated.
- E. Wood Nailers: Softwood lumber, pressure treated with waterborne preservatives for aboveground use, complying with AWPA C2; not less than 1-1/2 inches thick.
- F. Fasteners: Same metal as metals being fastened, or nonmagnetic stainless steel or other noncorrosive metal as recommended by manufacturer. Match finish of exposed fasteners with finish of material being fastened.
 1. Where removing exterior exposed fasteners affords access to building, provide nonremovable fastener heads.
- G. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, or PVC; or flat design of foam rubber, sponge neoprene, or cork.
- H. Bituminous Coating: SSPC-Paint 12, solvent-type bituminous mastic, nominally free of sulfur and containing no asbestos fibers, compounded for 15-mil dry film thickness per coating.
- I. Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, nondrying, nonmigrating sealant.
- J. Elastomeric Sealant: Generic type recommended by unit manufacturer that is compatible with joint surfaces; ASTM C 920, Type S, Grade NS, Class 25, and Uses NT, G, A, and, as applicable to joint substrates indicated, O.

2.3 ROOF HATCHES

- A. General: Fabricate units to withstand 40-lbf/sq. ft. external and 20-lbf/sq. ft. internal loading pressure. Frame with minimum 12-inch-high, integral-curb, double-wall construction with 1-1/2-inch insulation, formed cants and cap flashing (roofing counterflashing), with welded mechanical corner joints. Provide double-wall cover (lid) construction with 1-inch-thick insulation core. Provide gasketing and equip with corrosion-resistant or hot-dip galvanized hardware including pintle hinges, hold-open devices, interior padlock hasps, and both interior and exterior latch handles. Provide Bilco "LadderUp" safety post at each roof hatch
- B. Type: Single-leaf personnel access.
 1. For Ships' Ladder Access: 30 by 54 inches.

- C. Material: Galvanized steel sheets.
 - 1. Finish: Prime painted.
- D. Sloping Roofs: Where slope or roof deck exceeds 1/4 inch per foot, fabricate hatch curbs with height tapered to match slope to level tops of units.
- E. Safety Railing System: Manufacturer's standard complete system including rails, clamps, fasteners, safety barrier at railing opening, and all accessories required for a complete installation.
 - 1. Height: 42 inches (1060 mm) above finished roof deck.
 - 2. Pipe or Tube: 1-1/4-inch (31-mm) ID galvanized pipe or 1-5/8-inch (41-mm) OD galvanized tube.
 - 3. Self-Latching Gate: Fabricated of same materials and rail spacing as safety railing system. Provide manufacturer's standard hinges and self-latching mechanism.
 - 4. Pipe Ends and Tops: Covered or plugged with weather-resistant material.
 - 5. Provide weep holes or another means to drain entrapped water in hollow sections of handrail and railing members that are exposed to exterior or to moisture from condensation or other sources.
 - 6. Fabricate joints that will be exposed to weather in a watertight manner.
 - 7. Close exposed ends of handrail and railing members with prefabricated end fittings.
- F. Fasteners: Manufacturer's standard.

2.4 FINISHES, GENERAL

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

2.5 GALVANIZED STEEL SHEET FINISHES

- A. Surface Preparation: Clean surfaces with nonpetroleum solvent so surfaces are free of oil and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint specified below to comply with ASTM A 780.
 - 1. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.
- B. Factory Priming for Field-Painted Finish: Where field painting after installation is indicated, apply the air-dried primer specified below immediately after cleaning and pretreating.
 - 1. Shop Primer: Exterior galvanized metal primer per Division 9 Section "Exterior Painting."

ROOF ACCESSORIES

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Comply with manufacturer's written instructions. Coordinate installation of roof accessories with installation of roof deck, roof insulation, flashing, roofing membranes, penetrations, equipment, and other construction involving roof accessories to ensure that each element of the Work performs properly and that combined elements are waterproof and weathertight. Anchor roof accessories securely to supporting structural substrates so they are capable of withstanding lateral and thermal stresses, and inward and outward loading pressures.
- B. Install roof accessory items according to construction details of NRCA's "Roofing and Waterproofing Manual," unless otherwise indicated,
- C. Separation: Separate metal from incompatible metal or corrosive substrates, including wood, by coating concealed surfaces, at locations of contact, with bituminous coating or providing other permanent separation.
- D. Flange Seals: Unless otherwise indicated, set flanges of accessory units in a thick bed of roofing cement to form a seal.
- E. Cap Flashing: Where required as component of accessory, install cap flashing to provide waterproof overlap with roofing or roof flashing (as counter-flashing). Seal overlap with thick bead of mastic sealant.
- F. Operational Units: Test-operate units with operable components. Clean and lubricate joints and hardware. Adjust for proper operation.

3.2 CLEANING AND PROTECTION

- A. Clean exposed surfaces according to manufacturer's written instructions. Touch up damaged metal coatings.

- END OF SECTION -

- SECTION 07 8413 -

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. Through-penetration firestopping in fire rated construction.
 - 2. Construction gap firestopping at connections of the same or different materials in fire rated construction.
 - 3. Construction-gap firestopping occurring within fire-rated wall, floor or floor-ceiling assemblies.

1.3 RELATED DOCUMENTS

- A. Section 01 74 19 "Materials Recycling & Waste Management".
- B. Section 01 81 13 "LEED Certification Requirements".
- C. Section 07 2100 "Thermal Insulation" for fire safing insulation.
- D. Section 07 8446 "Fire-Resistive Joint Systems".

1.4 REFERENCES

- A. Underwriters Laboratories
 - 1. U.L. Fire Resistance Directory
 - a. Through-Penetration Firestop Devices (XHCR)
 - b. Fire Resistance Ratings (BXUV)
 - c. Through-Penetration Firestop Systems (XHEZ)
 - d. Fill, Void, or Cavity Material (XHHW)
 - e. Forming Material (XHKU)
 - 2. U.L. 1479 Test Method for Fire Tests of Through-Penetration Firestops, including optional air leak test.
 - 3. U.L. Component Listing Test Criteria

- 4. Warnock Hersey
- B. American Society for Testing and Materials Standards:
 - 1. ASTM E 814-88: Standard Test Method for Fire Tests of Through-Penetration Firestops.
 - 2. ASTM E 1399-91: Standard Test Method for Cyclic Movement and Measuring the Minimum and Maximum Joint Widths of Architectural Joint Systems.

1.5 DEFINITIONS

- A. Assembly: Particular arrangement of materials specific to given type of construction described or detailed in referenced documents.
- B. Barriers: Time rated fire walls, smoke barrier walls, time rated ceiling/floor assemblies and structural floors.
- C. Firestopping: Methods and materials applied in penetrations and unprotected openings to limit spread of heat, fire, gasses and smoke.
- D. Penetration: Opening or foreign material passing through or into barrier or structural floor such that full thickness of rated materials is not obtained.
- E. Construction gaps: Gaps between adjacent sections of walls, exterior walls, at wall tops between top of wall and ceiling, and structural floors or roof decks; and gaps between adjacent sections of structural floors.
- F. System: Specific products and applications classified and numbered by Underwriters Laboratories, Inc. to close specific barrier penetrations.
- G. Sleeve: Metal fabrication or pipe section extending through thickness of barrier and used to permanently guard penetration. Sleeves are described as part of penetrating system in other Sections and may or may not be required.

1.6 SYSTEM PERFORMANCE REQUIREMENTS

- A. General: Provide firestopping systems that are produced and installed to resist the spread of fire, according to requirements indicated, and the passage of smoke and other gases.
- B. F-Rated Through-Penetration Firestop Systems: Provide through-penetration firestop systems with F ratings indicated, as determined per ASTM E 814, but not less than that equaling or exceeding the fire-resistance rating of the constructions penetrated.
- C. T-Rated Through-Penetration Firestop Systems: Provide through-penetration firestop systems with T ratings, in addition to F ratings, as determined per ASTM E 814, where indicated and where systems protect penetrating items exposed to contact with adjacent materials in occupiable floor areas.
- D. Fire-Resistive Joint Sealants: Provide joint sealants with fire-resistance ratings indicated, as determined per ASTM E 119, but not less than that equaling or exceeding the fire-resistance rating of the construction in which the joint occurs.

PENETRATION FIRESTOPPING

- E. For firestopping exposed to view, traffic, moisture, and physical damage, provide products that do not deteriorate when exposed to these conditions.
- F. For firestopping exposed to view, provide products with flame-spread values of less than 25 and smoke-developed values of less than 450, as determined per ASTM E 84.

1.7 SUBMITTALS

- A. General: Submit the following according to Conditions of Contract and Division 1 Specification Sections.
- B. LEED Submittal: See Section 018113 LEED Certification Requirements for the following:
 - 1. EQc4.1 Adhesives & Sealants: Product data for adhesives & sealants, including printed statement of VOC content and chemical components.
- C. Product data for each type of product specified.
 - 1. Certification by firestopping manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs) and are nontoxic to building occupants.
- D. Shop drawings detailing materials, installation methods, and relationships to adjoining construction for each through-penetration firestop system, and each kind of construction condition penetrated and kind of penetrating item. Include firestop design designation of qualified testing and inspecting agency evidencing compliance with requirements for each condition indicated.
 - 1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration firestop configuration for construction and penetrating items.
- E. Product certificates signed by manufacturers of firestopping products certifying that their products comply with specified requirements.
- F. Product test reports from, and based on tests performed by, a qualified testing and inspecting agency evidencing compliance of firestopping with requirements based on comprehensive testing of current products.

1.8 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: Provide firestopping that complies with the following requirements and those specified under the "System Performance Requirements" article:
 - 1. Firestopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL, Warnock Hersey, or another agency performing testing and follow-up inspection services for firestop systems that is acceptable to authorities having jurisdiction.
 - 2. Through-penetration firestop systems are identical to those tested per ASTM E 814 under conditions where positive furnace pressure differential of at least 0.01 inch of water is maintained at a distance of 0.78 inch below the fill materials surrounding the penetrating items in the test assembly.

3. Fire-resistive joint sealant systems are identical to those tested for fire-response characteristics per ASTM E 119 under conditions where the positive furnace pressure differential is at least 0.01 inch of water, as measured 0.78 inch from the face exposed to furnace fire. Provide systems complying with the following requirements:
 - a. Fire-Resistance Ratings of Joint Sealants: As indicated by reference to design designations listed by UL in their "Fire Resistance Directory" or by another qualified testing and inspecting agency.
 - b. Joint sealants, including backing materials, bear classification marking of qualified testing and inspection agency.
- B. Information on drawings referring to specific design designations of through-penetration firestop systems is intended to establish requirements for performance based on conditions that are expected to exist during installation. Any changes in conditions and designated systems require the Architect's prior approval. Submit documentation showing that the performance of proposed substitutions equals or exceeds that of the systems they would replace and are acceptable to authorities having jurisdiction.
- C. Installer Qualifications: Engage an experienced Installer who is certified, licensed, or otherwise qualified by the firestopping manufacturer as having the necessary experience, staff, and training to install manufacturer's products per specified requirements. A manufacturer's willingness to sell its firestopping products to the Contractor or to an Installer engaged by the Contractor does not in itself confer qualification on the buyer.
 1. Prior to installing fire stop assemblies, the installer shall furnish the Architect with written proof of qualification from the manufacturer of the fire stop material, certifying that the installer has satisfactorily completed technical and installation training for the specified products.
 2. The manufacturer of the fire stop material shall, at no cost to the Owner or the Architect, provide sufficient inspections of installed systems to assure that all criteria required by the Project and by code are accomplished to the minimum standards shown in each UL system installed. The requirements of these Paragraphs 1.8.C.1 and 2 are in addition to any requirement and/or field inspection requirements requested by the local authority having jurisdiction.
- D. Single-Source Responsibility: Obtain through-penetration firestop systems for each kind of penetration and construction condition indicated from a single manufacturer.
- E. Provide firestopping products containing no detectable asbestos as determined by the method specified in 40 CFR Part 763, Subpart F, Appendix A, Section 1, "Polarized Light Microscopy."
- F. Coordinating Work: Coordinate construction of openings and penetrating items to ensure that designated through-penetration firestop systems are installed per specified requirements.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver firestopping products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer; date of manufacture; lot number; shelf life, if applicable; qualified testing and inspecting agency's classification marking applicable to Project; curing time; and mixing instructions for multi-component materials.

PENETRATION FIRESTOPPING

- B. Store and handle firestopping materials to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.10 PROJECT CONDITIONS

- A. Environmental Conditions: Do not install firestopping when ambient or substrate temperatures are outside limits permitted by firestopping manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- B. Ventilation: Ventilate firestopping per firestopping manufacturers' instructions by natural means or, where this is inadequate, forced air circulation.

1.11 SEQUENCING AND SCHEDULING

- A. Notify Owner's inspection agency at least 1 week in advance of firestopping installations; confirm dates and times on days preceding each series of installations.
- B. Do not cover up those firestopping installations that will become concealed behind other construction until Owner's inspection agency and authorities having jurisdiction, if required, have examined each installation.

PART 2 - PRODUCTS

2.1 FIRESTOPPING, GENERAL

- A. General: Provide through-penetration firestop systems containing the types of fill materials indicated in the Through-Penetration Firestop System Schedule at the end of Part 3 by referencing the types of materials described in this Article. Fill materials are those referred to in directories of referenced testing and inspecting agencies as "fill," "void," or "cavity" materials
- B. Compatibility: Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by firestopping manufacturer based on testing and field experience.
- C. Accessories: Provide components for each firestopping system that are needed to install fill materials and to comply with "System Performance Requirements" article in Part 1. Use only components specified by the firestopping manufacturer and approved by the qualified testing and inspecting agency for the designated fire-resistance-rated systems.
- D. Applications: Provide firestopping systems composed of materials specified in this Section that comply with system performance and other requirements.

2.2 FILL MATERIALS FOR THROUGH-PENETRATION FIRESTOP SYSTEMS

- A. Products: Systems or devices listed in the U.L. Fire Resistance Directory under categories XHCR and XHEZ may be used, providing that the system or device conforms to the construction type, penetrant type, annular space requirements and fire rating involved in each separate instance, and that the system be symmetrical for wall applications. Systems or devices must be asbestos-free. Mortar systems must be Warnock Hersey approved.
 - 1. Additional requirements: Withstand the passage of cold smoke either as an inherent property of the system, or by the use of a separate product included as a part of the U.L. system or device, and designed to perform this function.
 - 2. Acceptable manufacturers and products: Those listed in the U.L. Fire Resistance Directory for the U.L. System involved, or Mortar systems approved by Warnock Hersey, and as shown on Drawings.
 - 3. All firestopping products must be from a single manufacturer. All trades shall use products from the same manufacturer.
- B. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.
- C. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
- D. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized steel sheet.
- E. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.
- F. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.
- G. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.
- H. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.
- I. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives.

2.3 FIRE-RESISTIVE JOINT SEALANTS

- A. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer indicated that complies with ASTM C 920 requirements, including those referenced for Type, Grade, Class, and Uses, and requirements specified in this Section applicable to fire-resistive joint sealants.

1. Sealant Colors: Provide selections made by Architect from manufacturer's full range of standard colors for products of type indicated. Where exposed to view, match color of adjacent surface.
- B. Latex Sealants: Single-component latex formulations that after cure do not re-emulsify during exposure to moisture.
- C. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:
 1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces, and nonsag formulation for openings in vertical and other surfaces requiring a nonslumping, gunnable sealant, unless indicated firestop system limits use to nonsag grade for both opening conditions.
- D. Acceptable Manufacturers and Products: Those listed in the U.L. Fire Resistance Directory for the U.L. System involved and as shown on Drawings.

2.4 ACCESSORIES

- A. Fill, Void or Cavity Materials: As classified under Category XHHW in the U.L. Fire Resistance Directory.
- B. Forming Materials: As classified under Category XHKU in the U.L. Fire Resistance Directory.

2.5 MIXING

- A. For those products requiring mixing prior to application, comply with firestopping manufacturer's directions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other procedures needed to produce firestopping 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 firestopping. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Clean out openings and joints immediately prior to installing firestopping to comply with recommendations of firestopping manufacturer and the following requirements:
 1. Remove all foreign materials from surfaces of opening and joint substrates and from penetrating items that could interfere with adhesion of firestopping.

2. Clean opening and joint substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with firestopping. Remove loose particles remaining from cleaning operation.
 3. Remove laitance and form release agents from concrete.
- B. Priming: Prime substrates where recommended by firestopping manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Masking Tape: Use masking tape to prevent firestopping from contacting adjoining surfaces that will remain exposed upon completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestopping materials. Remove tape as soon as it is possible to do so without disturbing firestopping's seal with substrates.

3.3 INSTALLING THROUGH-PENETRATION FIRESTOPS

- A. General: Comply with the "System Performance Requirements" article in Part 1 and the through-penetration firestop manufacturer's installation instructions and drawings pertaining to products and applications indicated.
- B. Install forming/damming materials and other accessories of types required to support fill materials during their application and in the position needed to produce the cross-sectional shapes and depths required to achieve fire ratings of designated through-penetration firestop systems. After installing fill materials, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.
- C. Install fill materials for through-penetration firestop systems by proven techniques to produce the following results:
1. Completely fill voids and cavities formed by openings, forming materials, accessories, and penetrating items.
 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 Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 INSTALLING FIRE-RESISTIVE JOINT SEALANTS

- A. General: Comply with the "System Performance Requirements" article in Part 1, with ASTM C 1193, and with the sealant manufacturer's installation instructions and drawings pertaining to products and applications indicated.
- B. Install joint fillers to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability and develop fire-resistance rating required.
- C. Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint width that optimum sealant movement capability. Install sealants at the same time joint fillers are installed.

- D. Tool nonsag sealants immediately after sealant application and prior to the time skinning or curing begins. Form smooth, uniform beads of configuration indicated or required to produce fire-resistance rating, as well as to eliminate air pockets, and to ensure contact and adhesion of sealants with sides of joint. Remove excess sealant from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

3.5 FIELD QUALITY CONTROL

- A. Inspecting agency will examine completed firestopping to determine, in general, if it is being installed in compliance with requirements.
- B. Inspecting agency will report observations promptly and in writing to Contractor and Project Inspector.
- C. Do not proceed to enclose firestopping with other construction until reports of examinations are issued.
- D. Where deficiencies are found, repair or replace firestopping so that it complies with requirements.

3.6 CLEANING

- A. Clean off excess fill materials and sealants adjacent to openings and joints as work progresses by methods and with cleaning materials approved by manufacturers of firestopping products and of products in which opening and joints occur.
- B. Protect firestopping during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated firestopping immediately and install new materials to produce firestopping complying with specified requirements.

- END OF SECTION -

- SECTION 07 8446 -

FIRE-RESISTIVE JOINT SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes fire-resistive joint systems for the following:
 - 1. Floor-to-wall joints.
 - 2. Head-of-wall joints
 - 3. Joints between perimeter edge of fire-resistance-rated floor assemblies and back of non-fire-resistance-rated, exterior, insulated metal panel curtain wall system.

1.3 RELATED SECTIONS:

- A. Section 01 74 19 "Materials Recycling & Waste Management".
- B. Section 01 81 13 "LEED Certification Requirements".
- C. Section 07 2100 "Thermal Insulation" for perimeter fire-containment insulation systems if not specified in this Section.
- D. Section 07 8413 "Penetration Firestopping" for firestopping at non-joint conditions.
- E. Section 07 9200 "Joint Sealants" for non-fire-resistive joint sealants.

1.4 REFERENCES

- A. Underwriters Laboratories, Inc. (UL) Fire Resistance Directory, Volume II, updated annually:
 - 1. Joint Systems (XHBN)
 - 2. Perimeter Fire Containment Systems (XHDG)
 - 3. Fire Resistance Ratings (BXRH)
 - 4. Fill, Voids, or Cavity Material (XHHW)
 - 5. Forming Materials (XHKU)
- B. Omega Point Laboratories, Inc. (OPL) Listed Products Directory, Volume II, updated annually:

1. Fire Resistant Joint Systems
 - C. ASTM E 1966, "Standard Test Method for Fire-Resistive Joint Systems"
 - D. ASTM E 1399, "Test Method for Cyclic Movement and Measuring the Minimum and Maximum Joint Width of Architectural Joint Systems"
 - E. ASTM E 84, "Standard Test Method for Surface Burning Characteristics of Building Materials"
 - F. ASTM E 2174, "Standard Practice for On-Site Inspection of Installed Fire Stops"
 - G. ASTM E 2307, "Standard Test Method for Determining the Fire Endurance of Perimeter Fire Barrier Systems Using Intermediate-Scale, Multi-story Test Apparatus"
 - H. ANSI/UL 2079, "Tests for Fire Resistance of Building Joint Systems"
 - I. International Firestop Council Recommended (IFC) Guidelines for Evaluating Firestop Systems Engineering Judgments
 - J. All major building codes: ICBO, SBCCI, BOCA, and IBC.
 - K. NFPA 101 - Life Safety Code

1.5 PERFORMANCE REQUIREMENTS

- A. General: For joints in the following constructions, provide fire-resistive joint systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assembly in which fire-resistive joint systems are installed:
 1. Fire-resistance-rated non-load bearing wall, including partitions.
 2. Fire-resistance-rated floor assemblies.
 3. Exterior curtain-wall assemblies and fire-resistance-rated floor assemblies.
- B. Fire Resistance of Joint Systems: Assembly ratings and movement capabilities indicated, but with assembly ratings not less than that equaling or exceeding fire-resistance rating of constructions in which joints are located, as determined by UL 2079.
- C. Fire Resistance of Perimeter Fire-Containment Systems: Integrity and insulation ratings indicated as determined by NFPA 285 and UL 2079.

1.6 SUBMITTALS

- A. Submit Product Data: Manufacturer's specifications and technical data for each material including the composition and limitations, documentation of tested and listed firestop systems to be used and manufacturer's installation instructions to comply with Section 01 3219.
- B. LEED Submittal: See Section 018113 LEED Certification Requirements for the following:
 1. EQc4.1 Adhesives & Sealants: Product data for adhesives & sealants, including printed statement of VOC content and chemical components.

FIRE-RESISTIVE JOINT SYSTEMS

- C. Manufacturer's engineering judgment identification number and drawing details when no tested and listed system is available for an application. Engineering judgment shall include both project name and contractor's name who will install firestop system as described in drawing
- D. Shop Drawings: For each fire-resistive joint system, show each kind of construction condition in which joints are installed and relationships to adjoining construction. Include fire-resistive joint system design designation of testing and inspecting agency acceptable to authorities having jurisdiction that demonstrates compliance with requirements for each condition indicated.
- E. Product Certificates: For each type of fire-resistive joint system, signed by product manufacturer.
- F. Qualification Data: For Installer.
 - 1. Engage an experienced Installer who is certified, licensed, or otherwise qualified by the firestopping manufacturer as having been provided the necessary training to install manufacturer's products per specified requirements. A manufacturer's willingness to sell its firestopping products to the Contractor or to an Installer engaged by the Contractor does not in itself confer qualification on the buyer
- G. Compatibility and Adhesion Test Reports: From fire-resistive joint system manufacturer indicating the following:
 - 1. Materials forming joint substrates have been tested for compatibility and adhesion with fill materials.
 - 2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
- H. Submit material safety data sheets provided with product delivered to job-site

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: A firm that has been approved by FMG according to FMG 4991, "Approval of Firestop Contractors."
 - 1. For those firestop applications that exist for which no tested and listed system is available through a manufacturer, an engineering judgment derived from similar tested and listed system designs or other tests will be submitted to local authorities having jurisdiction for their review and approval prior to installation. Engineering judgment drawings shall follow requirements set forth by the International Firestop Council.
- B. Installation Responsibility: Assign installation of through-penetration firestop systems and fire-resistive joint systems in Project to a single qualified installer.
- C. Source Limitations: Obtain fire-resistive joint systems, for each kind of joint and construction condition indicated, through one source from a single manufacturer.
- D. Fire-Test-Response Characteristics: Provide fire-resistive joint systems that comply with the following requirements and those specified in Part 1 "Performance Requirements" Article:
 - 1. Fire-resistance tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL or another agency performing testing and follow-up inspection services for fire-resistive joint systems acceptable to authorities having jurisdiction.

2. Fire-resistive joint systems are identical to those tested per methods indicated in Part 1 "Performance Requirements" Article and comply with the following:
 - a. Fire-resistive joint system products bear classification marking of qualified testing and inspecting agency.
 - b. Fire-resistive joint systems correspond to those indicated by referencing system designations of the qualified testing and inspecting agency.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver fire-resistive joint system products to Project site in original, unopened containers or packages with qualified testing and inspecting agency's classification marking applicable to Project and with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, lot number, shelf life, curing time, and mixing instructions for multi-component materials.
- B. Store and handle materials for fire-resistive joint systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.9 PROJECT CONDITIONS

- A. Schedule installation of firestopping after completion of penetrating item installation but prior to covering or concealing of openings
- B. Verify existing conditions and substrates before starting work. Correct unsatisfactory conditions before proceeding
- C. Environmental Limitations: Do not install fire-resistive joint systems when ambient or substrate temperatures are outside limits permitted by fire-resistive joint system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- D. Ventilate fire-resistive joint systems per manufacturer's written instructions by natural means or, if this is inadequate, forced-air circulation.
- E. Do not use materials that contain flammable solvents.
- F. During installation, provide masking and drop cloths to prevent firestopping materials from contaminating any adjacent surfaces

1.10 COORDINATION

- A. Coordinate construction of joints to ensure that fire-resistive joint systems are installed according to specified requirements.
- B. Coordinate sizing of joints to accommodate fire-resistive joint systems.
- C. Do not cover up fire-resistive joint system installations that will become concealed behind other construction until Owner's Project Inspector has examined each installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products specified.
1. Fire-Resistive Joint Systems:
 - a. Hilti, Inc., Tulsa, Oklahoma (800) 879-8000/ www.us.hilti.com
 2. Perimeter Fire-Containment Systems:
 - a. Hilti, Inc., Tulsa, Oklahoma (800) 879-8000/ www.us.hilti.com.

2.2 MATERIALS

- A. Use only firestop products that have been tested in accordance with ASTM E 1966 and/or ANSI/UL 2079 for specific rated construction conditions conforming to construction assembly type, movement capability, spacing requirements, and fire-resistance-rating involved for each separate instance.
- B. Provide a firestop system with an Assembly Rating as determined by ASTM E 1966 and/or ANSI/UL 2079 which is equal to the fire-resistance ratings of the construction in which the joint occurs.
1. Provide fire-safing insulation approved by manufacture. Refer to Section 07 2100 "Thermal Insulation" for more information.

2.3 FIRE-RESISTIVE JOINT SYSTEMS, GENERAL

- A. Compatibility: Provide fire-resistive joint systems that are compatible with joint substrates, under conditions of service and application, as demonstrated by fire-resistive joint system manufacturer based on testing and field experience.
- B. Accessories: Provide components of fire-resistive joint systems, including forming materials, that are needed to install fill materials and to comply with Part 1 "Performance Requirements" Article. Use only components specified by fire-resistive joint system manufacturer and approved by the qualified testing and inspecting agency for systems indicated.

2.4 FIRE-RESISTIVE JOINT SYSTEMS

- A. Where UL-classified fire-resistive joint systems are indicated, they refer to alphanumeric designations listed in UL's "Fire Resistance Directory" under product Category XHBN.
- B. Sealants for use with fire-resistance-rated construction joints, the following products are acceptable:
1. Hilti CP 672 Speed Spray
 2. Hilti CP 601s Elastomeric Firestop Sealant
 3. Hilti CP 606 Flexible Firestop Sealant
 4. Hilti CP 604 Self-leveling Firestop Sealant

- C. Floor-to-Wall, Fire-Resistive Joint System:
 - 1. Basis-of-Design UL-Classified Product: FW-D 1013.
 - 2. Assembly Rating: 1 hour or greater.
 - 3. Joint Width: As indicated on drawings.
 - 4. Movement Capabilities: Minimum of 40 percent compression, extension, or horizontal shear. Tested 500 cycle testing in accordance with ICBO ES AC and meets ASTM E 1966

- D. Head-of-Wall, Fire-Resistive Joint System:
 - 1. Basis-of-Design UL-Classified Product: HW-D.
 - 2. Assembly Rating: 1 hour or greater.
 - 3. Nominal Joint Width: 3-inches.
 - 4. Movement Capabilities: Minimum of 40 percent compression, or extension.

2.5 PERIMETER FIRE-CONTAINMENT SYSTEMS

- A. Where UL-classified perimeter fire-containment systems are indicated, they refer to alphanumeric designations listed in UL's "Fire Resistance Directory" under product Category XHDG.

- B. Sealants for use as part of a Perimeter Fire Barrier System between fire-resistance-rated floors and exterior wall assemblies, the following products are acceptable:
 - 1. Hilti CP 672 Speed Spray
 - 2. Hilti CP 604 Self-leveling Firestop Sealant

- C. Perimeter Fire-Containment System:
 - 1. Basis-of-Design UL-Classified Product: CW-S-1007.
 - 2. Integrity Rating: 2 hours.
 - 3. Insulation Rating: 1/4 hour.
 - 4. Linear Opening Width: 6 inches (152 mm), maximum.

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.

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

3.2 PREPARATION

- A. Surface Cleaning: Clean joints immediately before installing fire-resistive joint systems to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:

FIRE-RESISTIVE JOINT SYSTEMS

1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of fill materials.
 2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with fill materials. Remove loose particles remaining from cleaning operation.
 3. Remove laitance and form-release agents from concrete.
- B. Priming: Prime substrates where recommended in writing by fire-resistive joint system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Masking Tape: Use masking tape to prevent fill materials of fire-resistive joint system from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from fire-resistive joint system materials. Remove tape as soon as possible without disturbing fire-resistive joint system's seal with substrates.

3.3 INSTALLATION

- A. General: Install fire-resistive joint systems to comply with Part 1 "Performance Requirements" Article and fire-resistive joint system manufacturer's written installation instructions for products and applications indicated.
- B. Install forming/packing/backing materials and other accessories of types required to support fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
- C. Install fill materials for fire-resistive joint systems by proven techniques to produce the following results:
1. Fill voids and cavities formed by openings and forming/packing/backing materials as required to achieve fire-resistance ratings indicated.
 2. Apply fill materials so they contact and adhere to substrates formed by joints.
 3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 FIELD QUALITY CONTROL

- A. Inspecting Agency: Owner will engage a qualified independent inspecting agency to inspect fire-resistive joint systems and to prepare inspection reports.
1. Project Inspector will state in each report whether inspected fire-resistive joint systems comply with or deviate from requirements.
- B. Proceed with enclosing fire-resistive joint systems with other construction only after inspection reports are issued and inspecting agency has approved installed fire-resistive joint systems.
- C. If deficiencies are found, repair or replace fire-resistive joint systems so they comply with requirements.

3.5 CLEANING AND PROTECTION

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

3.6 FIRE-RESISTIVE JOINT SYSTEM SCHEDULE

- A. Designation System for Joints in or between Fire-Resistance-Rated Constructions: Alphanumeric systems listed in UL's "Fire Resistance Directory" under Product Category XHBN.
- B. Designation System for Joints at the Intersection of Fire-Resistance-Rated Floor or Floor/Ceiling Assembly and an Exterior Curtain-Wall Assembly: Alphanumeric systems listed in UL's "Fire Resistance Directory" under Product Category XHDG:
 - 1. See drawings for specific assemblies required.

- END OF SECTION -

- SECTION 07 9200 -

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. This Section includes joint sealants for the following applications, including those specified by reference to this Section, and as noted in the schedule at the end of Part 3 of this section:
 - 1. Interior joints in the following vertical surfaces and horizontal nontraffic surfaces:
 - a. Control and expansion joints on exposed interior surfaces of exterior walls.
 - b. Perimeter joints of exterior openings where indicated.
 - c. Tile control and expansion joints.
 - d. Vertical joints on exposed surfaces of interior unit masonry walls and partitions.
 - e. Perimeter joints between interior wall surfaces and frames of interior doors, windows.
 - f. Joints between plumbing fixtures and adjoining walls, floors, and counters.
 - g. Control and expansion joints in ceilings and other overhead surfaces.
 - h. Joints between different materials listed above.
 - i. Other joints as indicated.
 - 2. Interior joints in the following horizontal traffic surfaces:
 - a. Isolation joints in cast-in-place concrete slabs.
 - b. Control and expansion joints in stone flooring.
 - c. Control and expansion joints in tile flooring.
 - d. Other joints as indicated.

1.3 RELATED SECTIONS

- A. Section 01 74 19 "Materials Recycling & Waste Management".
- B. Section 01 81 13 "LEED Certification Requirements".
- C. Section 07 8413 "Penetration Firestopping" for sealing joints in fire-resistance-rated construction.

- D. Section 07 8446 "Fire-Resistive Joint Systems" for sealing joints in fire-resistance-rated construction.
- E. Section 07 9500 "Expansion Control" for building expansion joints.
- F. Section 08 8000 "Glazing" for glazing sealants.
- G. Section 09 2900 "Gypsum Board" for sealing perimeter joints of gypsum board partitions to reduce sound transmission.
- H. Section 09 3013 "Ceramic Tile" for sealing tile joints.
- I. Section 09 5113 "Acoustical Panel Ceilings" for sealing edge moldings at perimeters of acoustical ceilings.
- J. Division 22 "Plumbing Fixtures" for sealing joints between fixtures and wall and floor surfaces.
- K. Section 32 1373 "Concrete Paving Joint Sealants" for sealing joints in pavements, walkways, curbing, and building perimeter.

1.4 SYSTEM PERFORMANCE REQUIREMENTS

- A. Provide elastomeric joint sealants that have been produced and installed to establish and to maintain watertight and airtight continuous seals without causing staining or deterioration of joint substrates.
- B. Provide joint sealants for interior applications that have been produced and installed to establish and maintain airtight continuous seals that are water resistant and cause no staining or deterioration of joint substrates.

1.5 PRECONSTRUCTION TESTING

- A. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates as follows:
 - 1. Locate test joints where indicated on Project or, if not indicated, as directed by Architect.
 - 2. Conduct field tests for each application indicated below:
 - a. Each kind of sealant and joint substrate indicated.
 - 3. Notify Architect seven days in advance of dates and times when test joints will be erected.
 - 4. Arrange for tests to take place with joint-sealant manufacturer's technical representative present.
 - a. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.

- 1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
5. Report whether sealant failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
6. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

1.6 SUBMITTALS

- A. Product data and color chart from manufacturers for each joint sealant product required.
 1. Certification by joint sealant manufacturer that materials provided for this Section are 100% asbestos-free.
- B. LEED Submittal:
 1. Product Data for Credit EQ 4.1: For sealants and sealant primers used inside the weatherproofing system, including printed statement of VOC content.
- C. Samples for initial selection purposes in form of manufacturer's standard bead samples, consisting of strips of actual products showing full range of colors available, for each product exposed to view.
- D. Preconstruction Field-Adhesion Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified in "Preconstruction Testing" Article.
- E. Field-Adhesion Test Reports: For each sealant application tested.

1.7 QUALITY CONTROL

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Sealants for Work of this Section shall be obtained from a single manufacturer for each different product required, to ensure that materials which come in contact with one another will be compatible. Installer shall supply a letter from the manufacturer certifying the compatibility of all sealants with one another, and with all construction materials with which they will come in contact on the Project.
- C. Product Testing: Test joint sealants using a qualified testing agency.
 1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multi-component materials.
- B. Store and handle materials in compliance with manufacturer's recommendations to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.9 PROJECT CONDITIONS

- A. Environmental Conditions: Do not proceed with installation of joint sealants under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside the limits permitted by joint sealant manufacturer.
 - 2. When joint substrates are wet.
- B. Joint Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than allowed by joint sealant manufacturer for application indicated.
- C. Joint Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with their adhesion are removed from joint substrates.

1.10 SEQUENCING AND SCHEDULING

- A. Sequence installation of joint sealants to occur not less than 21 nor more than 30 days after completion of waterproofing, unless otherwise indicated.

1.11 WARRANTY

- A. Provide a warranty, in writing and signed jointly by the installer and sealant manufacturer, agreeing to replace any or all joints failing within the warranty period at not cost to the Owner, labor and material inclusive.
 - 1. Warranty: 3 years

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, joint fillers, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
- B. VOC Content of Interior Sealants: Provide interior sealants and sealant primers that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - 1. Sealants: 250 g/L.

JOINT SEALANTS

2. Sealant Primers for Nonporous Substrates: 250 g/L.
 3. Sealant Primers for Porous Substrates: 775 g/L.
- C. Colors: Provide color of exposed joint sealants to comply with the following:
1. Provide selections made by Architect from manufacturer's full range of colors for products of type indicated.

2.2 ELASTOMERIC JOINT SEALANTS, TYPICAL

- A. Materials listed below are manufactured by Tremco, and establish the standard desired for this Project. Similar materials manufactured by the following are also acceptable:
1. Sonneborn
 2. Sika Corp.
 3. Pecora Corp.
 4. Mameco.
 5. Dow Corning.
 6. General Electric.
- B. Polyurethane sealants, multi-component. These sealants shall comply with ASTM C-920:
1. Sealant #1: Type M, Grade NS, Class 25, Use NT, M, A and O; capable of 50% extension and compression movement. (Dymeric 511)
 2. Sealant #2: Type M, Grade P, Class 25, Use T, M, A and O. (THC - 900/901)
- C. Silicone Sealants, one-part, complying with ASTM C-920:
1. Sealant #3: Type S, Grade NS, Class 25, Use NT, M, G, A and O; capable of 50% extension and compression movement. (Spectrem 2)
 2. Sealant #4: Type S, Grade NS, Class 25, Use NT, M, G, A and O; capable of 100% extension and 50% compression movement. (Spectrem 1)
 3. Sealant #5: Mildew-resistant, formulated with fungicide, Type S, Grade NS, Class 25, Use NT, A and O. (Tremsil 600) Color: White.
- D. Sealant #6: Acrylic latex sealant, one-part, complying with ASTM C-834. (Acrylic Latex 834 Caulk)
- E. Sealant #7: Acoustical sealant (ASTM D-217). (Tremco Acoustical Sealant)

2.3 JOINT SEALANT BACKING

- A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Plastic Foam Joint Fillers: Preformed, compressible, resilient, nonstaining, nonwaxing, nonextruding strips of flexible plastic foam of material indicated below and of size, shape, and density to control sealant depth and otherwise contribute to producing optimum sealant performance:
1. Closed-cell polyethylene foam, nonabsorbent to liquid water and gas, nonoutgassing in unruptured state.

- a. Horizontal Application: ITP "HBR" or approved equal.
 - b. Vertical Application: ITP closed-cell or soft-type backer rod or approved equal.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.4 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 in any way joint substrates and adjacent nonporous surfaces, and formulated to promote optimum adhesion of sealants with joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint sealant performance. Do not proceed with installation of joint sealants until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with recommendations of joint sealant manufacturer 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 concrete, masonry, unglazed surfaces of ceramic tile, and similar porous joint substrate surfaces by brushing, grinding, blast cleaning, 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 from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air.
 3. Remove laitance and form release agents from concrete.
 4. Clean metal, glass, porcelain enamel, glazed surfaces of ceramic tile, and other nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.

JOINT SEALANTS

- B. Joint Priming: Prime joint substrates where indicated or where recommended by joint sealant manufacturer based on preconstruction joint sealant-substrate tests or prior experience. Apply primer to comply with joint sealant manufacturer's recommendations. 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 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.
- D. Remove sealant and prepare joints in existing exterior locations as directed by representative of sealant manufacturer specified in this work.

3.3 INSTALLATION OF TYPICAL JOINT SEALANTS

- A. General: Comply with joint sealant manufacturer's printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Installation of Sealant Backings: Install sealant backings to comply with the following requirements:
 - 1. Install joint fillers of type indicated to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - a. Do not leave gaps between ends of joint fillers.
 - b. Do not stretch, twist, puncture, or tear joint fillers.
 - c. Remove absorbent joint fillers that have become wet prior to sealant application and replace with dry material.
 - 2. Install bond breaker tape between sealants where backer rods are not used between sealants and joint fillers or back of joints.
- D. Installation of Sealants: Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability. Install sealants at the same time sealant backings are installed.
- E. Tooling of Nonsag Sealants: Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated, to eliminate air pockets, and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.
 - 1. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.
 - 2. Provide flush joint configuration, per Figure 5B in ASTM C 1193, where indicated.
 - a. Use masking tape to protect adjacent surfaces of recessed tooled joints.
 - 3. Provide recessed joint configuration, per Figure 5C in ASTM C 1193, of recess depth and at locations indicated.

3.4 FIELD QUALITY CONTROL

- A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:
1. Extent of Testing: Test completed and cured sealant joints as follows:
 - a. Perform 10 tests for the first 1000 feet (300 m) of joint length for each kind of sealant and joint substrate.
 - b. Perform 1 test for each 1000 feet (300 m) of joint length thereafter or 1 test per each floor per elevation.
 2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.
 - a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
 3. Inspect tested joints and report on the following:
 - a. Whether sealants filled joint cavities and are free of voids.
 - b. Whether sealant dimensions and configurations comply with specified requirements.
 - c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.
 4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.
 5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.
- B. Evaluation of Field-Adhesion Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.5 CLEANING

- A. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.
- B. Clean excess adhesive from exposed surfaces of neoprene compression seal with solvent cleaner as recommended by manufacturer.

3.6 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so that and installations with repaired areas are indistinguishable from original work.

3.7 SCHEDULES, TYPICAL SEALANTS

- A. Exterior Locations:
1. Joints which are bordered by glass: Sealant #3.
 2. Joints which are bordered by plastic: Sealant #4.
 3. Horizontal joints in sidewalks, decks, concrete floors, and driveways: Sealant #2.
 - a. At walk expansion joints.
 - b. Where walks abut structural slabs or stoops.
 - c. Where walks abut exterior wall of buildings.
 - d. Where exposed interior concrete slabs abut vertical surfaces.
 - e. Where sealant is shown on the Drawings for concrete slabs.
 4. All other exterior joints: Sealant #1.
 - a. Around perimeters of frames where door, window and louver frames abut concrete, masonry or other building materials (interior and exterior).
 - b. Expansion and control joints in masonry walls (interior and exterior).
 - c. Masonry at dissimilar material or at dissimilar masonry.
 - d. Sills and thresholds.
 - e. At miscellaneous locations where sealant is shown on Drawings.
- B. Interior Locations:
1. Expansion and control joints: Sealant #1.
 2. Interior wet area and around plumbing fixtures: Sealant #5.
 3. Interior static dry joints as required to dress appearance: Sealant #6.
 4. Where required for sound control: Sealant #6 or #7.
- C. General:
1. Joints in construction between interior and exterior spaces and other designated or required locations to provide effective barrier against passage of elements: Sealant #1.
 2. Specialty perimeters where required for appearance or weather tightness: Sealants #1, #3 or #4.

- END OF SECTION -

- SECTION 07 9500 -
EXPANSION CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Architectural joint systems for building interiors.
 - 2. Architectural joint systems for building exteriors.

1.3 RELATED SECTIONS

- A. Section 01 74 19 "Materials Recycling & Waste Management".
- B. Section 01 81 13 "LEED Certification Requirements".
- C. Section 03 3000 "Cast-in-Place Concrete" for cast-in architectural-joint-system frames furnished, but not installed, in this Section.
- D. Section 07 6200 "Sheet Metal Flashing and Trim" for sheet metal wall joint systems.
- E. Section 07 7129 "Manufactured Roof Expansion Joints" for factory-fabricated roof joint systems.
- F. Section 07 8446 "Fire-Resistive Joint Systems" for liquid-applied joint sealants in fire-resistive building joints.
- G. Section 07 9200 "Joint Sealants" for liquid-applied joint sealants.
- H. Section 09 2900 "Gypsum Board".

1.4 DEFINITIONS

- A. Maximum Joint Width: Widest linear gap a joint system tolerates and in which it performs its designed function without damaging its functional capabilities.
- B. Minimum Joint Width: Narrowest linear gap a joint system tolerates and in which it performs its designed function without damaging its functional capabilities.

- C. Movement Capability: Value obtained from the difference between widest and narrowest widths of a joint opening typically expressed in numerical values (mm or inches) or a percentage (plus or minus) of nominal value of joint width.
- D. Nominal Joint Width: The width of the linear opening specified in practice and in which the joint system is installed.

1.5 SUBMITTALS

- A. Shop Drawings: Provide the following for each joint system specified:
 - 1. Placement Drawings: Include line diagrams showing plans, elevations, sections, details, splices, blockout requirement, entire route of each joint system, and attachments to other work. Where joint systems change planes, provide isometric or clearly detailed drawing depicting how components interconnect.
 - 2. Architectural Joint System Schedule: Prepared by or under the supervision of the supplier. Include the following information in tabular form:
 - a. Manufacturer and model number for each joint system.
 - b. Joint system location cross-referenced to Drawings.
 - c. Nominal joint width.
 - d. Movement capability.
 - e. Classification as thermal or seismic.
 - f. Materials, colors, and finishes.
 - g. Product options.
 - h. Fire-resistance ratings.
- B. LEED Submittal: See Section 018113 LEED Certification Requirements for the following:
 - 1. MRc4 Recycled Content: Product data for products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content.
 - a. Include cost information for each product having recycled content.
 - 2. MRc5 Regional Materials:
 - a. Sourcing location(s): indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery from the project site.
 - b. Manufacturing location(s): indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
 - c. Product Value: indicate dollar value of product containing regional materials; include materials costs only.
 - d. Product Component(s) Value: Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.
 - 3. EQc4.1 Adhesives & Sealants: Product data for adhesives & sealants, including printed statement of VOC content and chemical components.
- C. Samples for Verification: For each type of architectural joint system indicated.
 - 1. To be viewed on composite mock-up.

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- D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for current products.

1.6 QUALITY ASSURANCE

- A. Source Limitations: Obtain interior architectural joint systems through one source from a single manufacturer.
- B. Product Options: Drawings indicate size, profiles, and dimensional requirements of architectural joint systems and are based on the specific systems indicated. Refer to Division 1 Section "Product Requirements."
- C. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.
- D. Accessibility Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines (ADAAG)".
- E. Fire-Test-Response Characteristics: Where indicated, provide architectural joint system and fire-barrier assemblies identical to those of assemblies tested for fire resistance per UL 2079 or ASTM E 1966 by a testing and inspecting agency acceptable to authorities having jurisdiction.
- F. Hose Stream Test: Wall-to-wall and wall-to-ceiling assemblies shall be subjected to hose stream testing.

1.7 COORDINATION

- A. Coordinate installation of exterior wall and soffit joint systems with roof expansion assemblies to ensure that wall transitions are watertight. Roof expansion assemblies are specified in Division 7.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Aluminum: **ASTM B 221 (ASTM B 221M)**, Alloy 6063-T5 for extrusions; **ASTM B 209 (ASTM B 209M)**, Alloy 6061-T6 for sheet and plate.
 - 1. Apply manufacturer's standard protective coating on aluminum surfaces to be placed in contact with cementitious materials.
 - 2. Class II, Clear Anodic Finish: AA-M12C22A31 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.010 mm or thicker) complying with AAMA 611.
- B. Elastomeric Seals: Preformed elastomeric membranes or extrusions to be installed in metal frames.

- C. Compression Seals: ASTM E 1612; preformed rectangular elastomeric extrusions having internal baffle system and designed to function under compression.
- D. Strip Seals: ASTM E 1783; preformed elastomeric membrane or tubular extrusions having an internal baffle system and secured in or over a joint by a metal locking rail.
- E. Extruded Preformed Seals: Single or multi-layered rubber extrusions as classified under ASTM D2000, designed with or without continuous, longitudinal, internal baffles and formed to fit compatible frames, in color indicated or if not indicated, as selected by architect from manufacturer's standard colors.
- F. Exterior Seals: Typically two single layered flexible extrusions, one interior PVC and one exterior Santoprene 8000 series non-hydroscopic, thermoplastic rubber, as classified under ASTM D2000, retained in a set of compatible frames, in color indicated or if not indicated, as selected by architect from manufacturer's standard colors.
- G. Cellular Foam Seals: Extruded, compressible foam designed to function under compression.
- H. Elastomeric Concrete: Modified epoxy or polyurethane extended into a prepackaged aggregate blend, specifically designed for bonding to concrete substrates.
- I. Fire Barriers: Any material or material combination, when fire tested after cycling, designated to resist the passage of flame and hot gases through a movement joint and to meet performance criteria for required rating period.
- J. Moisture Barrier: Flexible elastomeric material,
 - 1. EPDM, minimum 30 mils thick.
 - 2. PVC, minimum 40 mils thick.
 - 3. Santoprene.
- K. Accessories: Manufacturer's standard anchors, clips, fasteners, set screws, spacers, and other accessories compatible with material in contact, as indicated or required for complete installations.

2.2 ARCHITECTURAL JOINT SYSTEMS, GENERAL

- A. General: Provide architectural joint systems of design, basic profile, materials, and operation indicated. Provide units with capability to accommodate variations in adjacent surfaces.
 - 1. Furnish units in longest practicable lengths to minimize field splicing. Install with hairline mitered corners where joint changes direction or abuts other materials.
 - 2. Include factory-fabricated closure materials and transition pieces, tee-joints, corners, curbs, cross-connections, and other accessories as required to provide continuous joint systems.
- B. Design architectural joint systems for the following size and movement characteristics:
 - 1. Nominal Joint Width: As indicated.
 - 2. Movement Capability: Plus or minus 100 percent, unless otherwise noted.
 - 3. Type of Movement: Seismic.

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2.3 FABRICATION

- A. General – Provide expansion joint cover assemblies of design, basic profile, materials, and operation indicated. Select units comparable to those indicated or required to accommodate joint size, variations in adjacent surfaces, and structural movement. Furnish units in longest practicable lengths to minimize number of end joints. Provide hairline-mitered corners where joint changes directions or abuts other materials. Include closure materials and transition pieces., tee-joints, corners, curbs, cross-connections and other accessories as required to provide continuous joint cover assemblies.

2.4 ARCHITECTURAL JOINT SYSTEMS FOR BUILDING INTERIORS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide the products specified in individual subparagraphs below as basis-of-design products or a comparable product by one of the following:
1. Balco, Inc.
 2. C/S Group.
 3. JointMaster, a division of In-Pro Corporation.
 4. MM Systems Corporation.
 5. Nystrom, Inc.
- B. Floor-to-Floor Joint Systems: (Carpet & Resilient Floor Coverings)
1. Basis-of-Design Product: Model 222-A07-250 as manufactured by In-Pro Corporation.
 2. Flush Seismic Cover Assemblies – Provide continuous extruded aluminum frame assemblies of a suitable profile to receive free floating cover plate of design indicated. Center plate to be held in place and kept centered throughout movement cycle by stainless steel turnbar spaced 24" on center maximum. Assembly (where indicated) to be sealed with dual durometer, colorable thermoplastic seals with rigid edges for positive attachment to frame and center plate. Free from grooves or ridges, seals to have flexible core of shore hardness 73 to allow maximum movement of 1 inch without gaps occurring between seal and cover assembly. Center plate to include concealed lifting device to allow full seismic movement without damage to cover. Seals to disengage under seismic conditions only. All aluminum in contact with concrete to have heavy metal free high solids primer.
 - a. At VCT Floor Finishes – Provide continuous frame on each side of joint designed to support aluminum center plate recessed to receive floor finish inlay. Joint system to be capable of + and – 7" seismic movement.
 - b. At Other Floor Finishes - Provide continuous frame on each side of joint designed to support aluminum center plate. Aluminum center plate to receive factory-supplied stainless steel inlay with #4 finish. Joint system to be capable of + and – 7" seismic movement.
 3. Attachment Method: Cast in.
 - a. Recess Depth: As required to accommodate adjacent flooring.
 4. Load Capacity:
 - a. Uniform Load: 150 lb/sq. ft. (732 kg/sq. m).
 - b. Concentrated Load: 2000 lb (907 kg).
 - c. Maximum Deflection: 0.5 inch (13 mm).
 5. Fire-Resistance Rating: Provide joint system and fire-barrier assembly with a rating not less than that of adjacent construction.

6. Moisture Barrier: Manufacturer's standard.
- C. Floor-to-Floor Joint Systems: (Stone Flooring)
1. Basis-of-Design Product: Model 222-A07-250 as manufactured by In-Pro Corporation.
 2. Extruded Aluminum Recessed Pan Seismic Cover Assemblies – Provide continuous extruded aluminum frame assemblies of suitable profile to receive free floating center plate of design indicated. Center plate to be held in place and kept centered throughout movement cycle by spring-loaded stainless steel turnbar spaced 18" on center maximum. Center plate to include concealed lifting device to allow full seismic movement without damage to cover. Cover to disengage under seismic conditions only. Cover shall be designed to achieve movement of $\pm 1/2$ " thermal movement, + and – 7" horizontal movement during a seismic event. All aluminum in contact with concrete to have heavy metal free high solids primer.
 - a. Concealed Stone Flush Floor Cover – Provide continuous frame on each side of joint, designed to support center pan and receive stone paver or concrete fill.
 3. Attachment Method: Cast in.
 - a. Recess Depth: As required to accommodate adjacent flooring.
 4. Load Capacity:
 - a. Uniform Load: 150 lb/sq. ft. (732 kg/sq. m).
 - b. Concentrated Load: 2000 lb (907 kg).
 - c. Maximum Deflection: 0.5 inch (13 mm).
 5. Fire-Resistance Rating: Provide joint system and fire-barrier assembly with a rating not less than that of adjacent construction.
 6. Moisture Barrier: Manufacturer's standard.
- D. Wall-to-Wall & Ceiling to Ceiling Joint Systems:
1. Basis-of-Design Product: Model 243-A07-250 as manufactured by In-Pro Corporation.
 2. Lightweight Composite Seismic Cover Assemblies – Provide continuous extruded aluminum frame assemblies of suitable profile to receive free floating composite panel of design indicated. Panel shall be held in place with a hook and loop attachment system, spaced at a maximum 18" on center. A secondary support system comprised of pre-tensioned shock cords shall be installed directly behind the panel and attached with removable stainless steel spring clips.
 - a. Flush Wall/Ceiling Cover – Provide continuous frame on each side of joint designed to support panel and finish flush with adjacent wall or ceiling surface. Cover to be of lightweight composite construction. Joint system to be capable of + and – 7" seismic movement. Panel shall be field primed and painted or covered with field-applied wall covering.
 3. Type: Free-Floating plate.
 - a. Exposed Metal: Aluminum.
 - 1) Finish: Manufacturer's standard finish.
 4. Fire-Resistance Rating: Provide joint system and fire-barrier assembly with a rating not less than that of adjacent construction.
 5. Moisture Barrier: Manufacturer's standard.
- E. Floor-to-Wall Joint Systems:
1. Basis-of-Design Product: Model 222-A09-250 as manufactured by In-Pro Corporation.
 2. Type: Elastomeric seal.

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- a. Exposed Metal: Aluminum.
 - 1) Finish: Manufacturer's standard finish.
- b. Seal Material: Santoprene.
 - 1) Color: As selected by Architect from manufacturer's full range.
- 3. Attachment Method: Cast in.
 - a. Recess Depth: As required to accommodate adjacent flooring.
- 4. Load Capacity:
 - a. Uniform Load: 150 lb/sq. ft. (732 kg/sq. m).
 - b. Concentrated Load: 2000 lb (907 kg).
 - c. Maximum Deflection: 0.5 inch (13 mm).
- 5. Fire-Resistance Rating: Provide joint system and fire-barrier assembly with a rating not less than that of adjacent construction.
- 6. Moisture Barrier: Manufacturer's standard.

F. Wall to Corner Joint Systems:

- 1. Basis-of-Design Product: Model 243-A09-250 as manufactured by In-Pro Corporation.
- 2. Type: Glide plate.
 - a. Exposed Metal: Aluminum.
 - 1) Finish: Manufacturer's standard finish.
- 3. Fire-Resistance Rating: Provide joint system and fire-barrier assembly with a rating not less than that of adjacent construction.
- 4. Moisture Barrier: Manufacturer's standard.

2.5 ARCHITECTURAL JOINT SYSTEMS FOR BUILDING EXTERIORS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide the products specified in individual subparagraphs below as basis-of-design products or a comparable product by one of the following:
 - 1. Balco, Inc.
 - 2. Construction Specialties, Inc.
 - 3. JointMaster, a division of InPro Corporation.
 - 4. MM Systems Corporation.
 - 5. Nystrom, Inc.
 - 6. Tremco Sealant/Weatherproofing Division.
- B. Architectural Joint Systems for Exterior Walls:
 - 1. Basis-of-Design Products: Models 616-A07-250 and 616-A09-250 as manufactured by In-Pro Corporation.
 - 2. Vertical Exterior Seals – Thermoplastic rubber primary seals extruded in Santoprene retained in extruded aluminum side frames complete with independent continuous PVC back seal. Side frames mounted on butyl caulk tape with appropriate anchor 18" on center. Installation to include factory, heat welded transitions where applicable to ensure a watertight system. System to include material for field-formed flexible base closures at base of vertical joints.
 - a. Supply primary seal with multi movement grooves designed to remain in place throughout movement of the joint.

- b. Joint system to be capable of + and – 7" seismic movement.
3. Color of primary seal to be custom color selected by architect.

2.6 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces where architectural joint systems will be installed for installation tolerances and other conditions affecting performance of work.
 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to architectural joint system manufacturer's written instructions.
- B. Repair concrete slabs and blockouts using manufacturer's recommended repair grout of compressive strength adequate for anticipated structural loadings.
- C. Coordinate and furnish anchorages, setting drawings, and instructions for installing joint systems. Provide fasteners of metal, type, and size to suit type of construction indicated and to provide for secure attachment of joint systems.
- D. Cast-In Frames: Coordinate and furnish frames to be cast into concrete.

3.3 INSTALLATION

- A. Comply with manufacturer's written instructions for storing, handling, and installing architectural joint assemblies and materials unless more stringent requirements are indicated.
- B. Metal Frames: Perform cutting, drilling, and fitting required to install joint systems.
 1. Install in true alignment and proper relationship to joints and adjoining finished surfaces measured from established lines and levels.
 2. Adjust for differences between actual structural gap and nominal design gap due to ambient temperature at time of installation. Notify Architect where discrepancies occur that will affect proper joint installation and performance.
 3. Cut and fit ends to accommodate thermal expansion and contraction of metal without buckling of frames.

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4. Locate in continuous contact with adjacent surfaces.
 5. Heavy-Duty Systems: Repair or grout blockout as required for continuous frame support and to bring frame to proper level. Shimming is not allowed.
 6. Locate anchors at interval recommended by manufacturer, but not less than **3 inches (75 mm)** from each end and not more than **24 inches (600 mm)** o.c.
- C. Seals in Metal Frames: Install elastomeric seals and membranes in frames to comply with manufacturer's written instructions. Install with minimum number of end joints.
1. Provide in continuous lengths for straight sections.
 2. Seal transitions according to manufacturer's written instructions. Vulcanize or heat-weld field-spliced joints as recommended by manufacturer.
 3. Installation: Mechanically lock seals into frames or adhere to frames with adhesive or pressure-sensitive tape as recommended by manufacturer.
- D. Compression Seals: Apply adhesive or lubricant adhesive as recommended by manufacturer to both frame interfaces before installing compression seals.
- E. Foam Seals: Install with adhesive recommended by manufacturer.
- F. Epoxy-Bonded Seals: Pressurize seal for time period and to pressure recommended by manufacturer. Do not over pressurize.
- G. Terminate exposed ends of joint assemblies with field- or factory-fabricated termination devices.
- H. Fire-Resistance-Rated Assemblies: Coordinate installation of architectural joint assembly materials and associated work so complete assemblies comply with assembly performance requirements.
1. Fire Barriers: Install fire barriers to provide continuous, uninterrupted fire resistance throughout length of joint, including transitions and field splices.
- I. Water Barrier: Provide water barrier at exterior joints and where called for on Drawings. Provide drainage fittings at a maximum of **50 feet (15.2 m)** or where indicated.

3.4 PROTECTION

- A. Do not remove protective covering until finish work in adjacent areas is complete. When protective covering is removed, clean exposed metal surfaces to comply with manufacturer's written instructions.
- B. Protect the installation from damage by work of other Sections. Where necessary due to heavy construction traffic, remove and properly store cover plates or seals and install temporary protection over joints. Reinstall cover plates or seals prior to Substantial Completion of the Work

- END OF SECTION -

DIVISION 08 – DOORS & WINDOWS

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- SECTION 08 1113 -

HOLLOW METAL DOORS & FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Steel doors.
 - 2. Steel door frames.
 - 3. Vision frames.
 - 4. Fire-rated door and frame assemblies.
- B. Gasketing and hardware required for fire-rated door assemblies to comply with CBC 7-2 (2001) are specified in Section 08 7111 "Door Hardware".

1.3 RELATED SECTIONS

- A. Section 01 74 19 "Materials Recycling & Waste Management".
- B. Section 01 81 13 "LEED Certification Requirements".
- C. Section 08 7111 "Door Hardware" for coordination of hardware installation.
- D. Section 08 8000 "Glazing" for installation of glazing in hollow metal doors and farming systems, including STC sound rating.
- E. Section 09 2900 "Gypsum Board" for coordination of installation.
- F. Sections 09 9113 "Exterior Painting" and 09 9123 "Interior Painting" for field painting hollow metal doors and frames.
- G. Section 13 4900 "Radiation Protection" for lead-lined, hollow metal doors and frames.
- H. Division 26 Sections for electrical connections including conduit and wiring for door controls and operators.

1.4 DEFINITIONS

- A. Steel Sheet Thicknesses: Thickness dimensions, including those referenced in ANSI A250.8, are minimums as defined in referenced ASTM standards for both uncoated steel sheet and the uncoated base metal of metallic-coated steel sheets.

1.5 REFERENCES

- A. ANSI A250.8-1998/SDI-100 - Recommended Specifications - Standard Steel Doors and Frames, Steel Door Institute, unless herein specified.
- B. Underwriters' Laboratories Inc. (UL) UL 10C-98 – Fire Tests of Door Assemblies.
- C. NFPA-80-1999 – Standard for Fire Doors and Windows.
- D. NFPA-101-1997 – Life Safety Code.
- E. NFPA-105 – Standard for Smoke and Draft Control Assemblies.
- F. ASTM-A 366-95A – Specification for Steel, Sheet, Carbon, Cold-Rolled, Commercial Quality.
- G. ASTM-A 568-95 – Specification for Steel, Sheet, Carbon, and High Strength, Low-Alloy, Hot-Rolled, and Cold-Rolled.
- H. ASTM-A 569-91a – Specification for Steel, Carbon, (0.15 maximum percent), Hot-Rolled Sheet and Strip Commercial Quality.
- I. ASTM-A 924-95 – General Requirements for Steel Sheet, Metallic Coated by the Hot-Dip Process.
- J. SDI-105-92 – Recommended Erection Instructions for Steel Frames.
- K. ANSI A115.1-.18 - Specification for Door and Frame Preparation for Hardware.
- L. ANSI A156.7 - Standard Template Hinge Dimensions.

1.6 SUBMITTALS

- A. Product Data: For each type of door and frame indicated, include door designation, type, level and model, material description, core description, construction details, label compliance, sound and fire-resistance ratings, and finishes.
- B. LEED Submittal: See Section 018113 LEED Certification Requirements for the following:
 - 1. MRc4 Recycled Content: Product data for products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content.
 - a. Include cost information for each product having recycled content.
 - 2. MRc5 Regional Materials:
 - a. Sourcing location(s): indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery from the project site.

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- b. Manufacturing location(s): indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
 - c. Product Value: indicate dollar value of product containing regional materials; include materials costs only.
 - d. Product Component(s) Value: Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.
- 3. EQc4.1 Adhesives & Sealants: Product data for adhesives & sealants, including printed statement of VOC content and chemical components.
 - 4. EQc4.2 Paints & Coatings: Product data for paints & coatings, including printed statement of VOC content and chemical components.
- C. Door Schedule: Use same reference designations indicated on Drawings in preparing schedule for doors and frames.
 - D. Shop Drawings: Include the following:
 - 1. Elevations of each door design.
 - 2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
 - 3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 - 4. Locations of reinforcement and preparations for hardware.
 - 5. Details of each different wall opening condition.
 - 6. Details of anchorages, joints, field splices, and connections.
 - 7. Details of accessories.
 - 8. Details of moldings, removable stops, and glazing.
 - 9. Details of conduit and preparations for power, signal, and control systems.
 - E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each type of hollow metal door and frame assembly.

1.7 QUALITY ASSURANCE

- A. Steel Door and Frame Standard: Comply with ANSI A 250.8, unless more stringent requirements are indicated.
- B. Applicable Standards: Specifications and standards of SDI 100-98.
- C. Wind Load Performance Requirements: Comply with wind load requirements of Uniform Building Code. Deflection shall not exceed 1/175 of span.
- D. Supplier Qualification: Qualified direct distributor of products to be furnished. The distributor shall have in their regular employment an A.H.C. /C.D.C. or person of equivalent experience who will be available at reasonable times to consult with the Architect, Contractor and/or Owner regarding any matters affecting the total door and frame openings.
- E. Installer Qualification: Experience with installation of similar materials.

- F. Fire-Rated Door Assemblies: Where fire-rated door assemblies are indicated or required, provide fire-rated door and frame assemblies that comply with NFPA 80 "Standard for Fire Doors and Windows", and have been tested, listed, and labeled in accordance with ASTM E152 "Standard Methods of Fire Tests of Door Assemblies" by nationally recognized independent testing and inspection agency acceptable to authorities having jurisdiction.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver doors and frames cardboard-wrapped or crated to provide protection during transit and job storage. Provide additional protection to prevent damage to finish of factory-finished doors and frames.
- B. Inspect doors and frames on delivery for damage, and notify shipper and supplier if damage is found. Minor damages may be repaired provided refinished items match new work and are acceptable to Architect. Remove and replace damaged items that cannot be repaired as directed.
- C. Store doors and frames at building site under cover. Place units on minimum 4-inch-wood blocking. Avoid using nonvented plastic or canvas shelters that could create a humidity chamber. If door packaging becomes wet, remove cartons immediately. Provide minimum 1/4-inch between stacked doors to permit air circulation.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Hot-Rolled Steel Sheets: ASTM A 569, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- B. Cold-Rolled Steel Sheets: ASTM A 366, Commercial Steel (CS), or ASTM A 620, Drawing Steel (DS), Type B; stretcher-leveled standard of flatness.
- C. Metallic-Coated Steel Sheets: ASTM A 653, Commercial Steel (CS), Type B, with an A40 (galvannealed) coating; stretcher-leveled standard of flatness.
 - 1. For exterior installations.
- D. Electrolytic Zinc-Coated Steel Sheet: ASTM A 591, Commercial Steel (CS), Class B coating; mill phosphatized; suitable for unexposed applications; stretcher-leveled standard of flatness where used for face sheets.

2.2 ACCEPTABLE MANUFACTURERS

- A. Providing the products supplied comply with specifications.
 - 1. Curries Company; an Assa Abloy Group company.
 - 2. Capitol Builders Hardware, Inc.
 - 3. Ceco Door Products; an Assa Abloy Group company.
 - 4. Door Components, Inc.
 - 5. Security Metal Products Corp.

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6. Steelcraft; an Ingersoll-Rand company.

2.3 DOORS

- A. General: Provide doors of sizes, thicknesses, and designs indicated.
- B. Interior Doors: Provide doors complying with requirements indicated below by referencing ANSI 250.8 for level and model and ANSI A250.4 for physical-endurance level:
 1. Level 3 and Physical Performance Level A (Extra Heavy Duty), Model 2 (Seamless) (0.053-inch / 16 ga. thick).
- C. Vision Lite Systems: Manufacturer's standard kits for metal doors consisting of glass lite moldings to accommodate glass thickness and size of vision lite indicated.

2.4 FRAMES

- A. General: Provide steel frames for doors, transoms, sidelights, borrowed lights, and other openings that comply with ANSI A250.8 and with details indicated for type and profile. Conceal fastenings, unless otherwise indicated.
- B. Frames of 0.067-inch- (14 ga.) thick steel sheet for:
 1. Level 3 steel doors, unless otherwise indicated.
 2. Wood doors, unless otherwise indicated.
- C. Door Silencers: Except on weather-stripped frames, fabricate stops to receive three silencers on strike jambs of single-door frames and two silencers on heads of double-door frames.
- D. Plaster Guards: Provide 0.020-inch- (24 ga.) thick, steel sheet plaster guards or mortar boxes to close off interior of openings; place at back of hardware cutouts where mortar or other materials might obstruct hardware operation.
- E. Supports and Anchors: Fabricated from not less than 0.042-inch- (18 ga.) thick, electrolytic zinc-coated or metallic-coated steel sheet.
 1. Wall Anchors in Masonry Construction: 0.177-inch-diameter, steel wire complying with ASTM A 510 may be used in place of steel sheet.
- F. Inserts, Bolts, and Fasteners: Manufacturer's standard units. Where zinc-coated items are to be built into exterior walls, comply with ASTM A 153, Class C or D as applicable.
- G. Coating Materials, primer: Use manufacturer's standard rust inhibiting primer conforming to ANSI-A224.1-1990.

2.5 FABRICATION

- A. General: Fabricate steel door and frame units to comply with ANSI A250.8 and to be rigid, neat in appearance, and free from defects including warp and buckle. Where practical, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory assembled before shipment, to assure proper assembly at Project site.

- B. Interior Doors: Face sheets fabricated from cold-rolled steel sheet. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
 - 1. Level 3 and Physical Performance Level A (Extra Heavy Duty), Model 2 (Seamless).
- C. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.
 - 1. Reinforce doors and frames to receive surface-applied hardware. Drilling and tapping for surface-applied hardware may be done at Project site.
- D. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.
- E. Core Construction: Manufacturer's standard core construction that produces a door complying with SDI standards.
- F. Single-Acting, Door-Edge Profile: Square edge, unless beveled edge is indicated.
- G. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."
- H. Fabricate concealed stiffeners, reinforcement, edge channels, louvers, and moldings from either cold- or hot-rolled steel sheet.
- I. Exposed Fasteners: Unless otherwise indicated, provide countersunk flat or oval heads for exposed screws and bolts.
- J. Hardware Preparation: Prepare doors and frames to receive mortised and concealed hardware according to final door hardware schedule and templates provided by hardware supplier. Comply with applicable requirements in ANSI A250.6 and ANSI A115 Series specifications for door and frame preparation for hardware.
- K. Frame Construction: Fabricate frames to shape shown.
 - 1. Fabricate frames with mitered and continuously welded corners and seamless face joints (knock-down frames not acceptable).
- L. Locate hardware as indicated on Shop Drawings or, if not indicated, according to ANSI A250.8.
- M. Glazing Stops: Manufacturer's standard, formed from 0.032-inch-thick (20 ga.) steel sheet.
 - 1. Provide nonremovable stops on outside of exterior doors and on secure side of interior doors for glass, louvers, and other panels in doors.
 - 2. Provide screw-applied, removable, glazing stops on inside of glass, louvers, and other panels in doors, using vandal-resistant screws.

2.6 FINISHES

- A. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.
 - 1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

HOLLOW METAL DOORS & FRAMES

2.7 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. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness to the following tolerances:
 - 1. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - 2. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
 - 3. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - 4. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a perpendicular line from head to floor.
- C. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

2.8 INSTALLATION

- A. General: Install steel doors, frames, and accessories according to ANSI A250.8, manufacturer's data, and as specified.
- B. Placing Frames: Comply with provisions in SDI 105, unless otherwise indicated. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders, leaving surfaces smooth and undamaged.
 - 1. Place frames before construction of enclosing walls and ceilings.
 - 2. In metal-stud partitions, provide at least three wall anchors per jamb; install adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Attach wall anchors to studs with screws.
 - 3. Install fire-rated frames according to NFPA 80.
 - 4. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs at floor.
- C. Door Installation: Comply with ANSI A250.8. Fit hollow-metal doors accurately in frames, within clearances specified in ANSI A250.8. Shim as necessary to comply with SDI 122 and ANSI/DHI A115.1G.
 - 1. Fire-Rated Doors: Install within clearances specified in NFPA 80.

- D. Glazing: Comply with installation requirements in Division 08 Section "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 (230 mm)** o.c. and not more than **2 inches (50 mm)** o.c. from each corner.

2.9 ADJUSTING AND CLEANING

- A. Prime-Coat Touchup: Immediately after installation, sand smooth any rusted or damaged areas of prime coat and apply touch up of compatible air-drying primer.
- B. Protection Removal: Immediately before final inspection, remove protective wrappings from doors and frames.
- C. 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.

- END OF SECTION -

- SECTION 08 1216 -

INTERIOR ALUMINUM FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Interior aluminum framing.
 - 2. Interior aluminum frames for doors.
 - 3. Interior aluminum frames for glazing.

1.3 RELATED SECTIONS

- A. Section 01 74 19 "Materials Recycling & Waste Management".
- B. Section 01 81 13 "LEED Certification Requirements".
- C. Section 07 9200 "Joint Sealants" for joint sealants installed with interior aluminum frames and for sealants to the extent not specified in this Section.
- D. Section 08 1416 "Flush Wood Doors" for wood doors installed in interior aluminum frames.
- E. Section 08 3113 "Flush Fiberglass Doors" for fiberglass doors installed in interior aluminum frames.
- F. Section 08 7111 "Door Hardware" for door hardware.
- G. Section 08 8000 "Glazing" for glass in interior aluminum frames.
- H. Section 09 2900 "Gypsum Board" for partitions.

1.4 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of interior aluminum frame indicated.

- B. LEED Submittal: See Section 018113 LEED Certification Requirements for the following:
 - 1. MRc4 Recycled Content: Product data for products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content.
 - a. Include cost information for each product having recycled content.
 - 2. MRc5 Regional Materials:
 - a. Sourcing location(s): indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery from the project site.
 - b. Manufacturing location(s): indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
 - c. Product Value: indicate dollar value of product containing regional materials; include materials costs only.
 - d. Product Component(s) Value: Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.
- C. Shop Drawings: For interior aluminum frames. Include plans, elevations, sections, details, and attachments to other work.
- D. Samples for Verification: 12-inch- (300-mm-) long framing member with factory-applied finish for each type of interior aluminum frame indicated. Color as indicated within this section.
- E. Fabrication Sample: For each vertical-to-horizontal intersection of systems, made from 12-inch (300-mm) lengths of full-size components and showing details of assembly.
- F. Maintenance Data: For interior aluminum frames to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Product Options: Drawings indicate size, profiles, and dimensional requirements of interior aluminum frames and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Custom Components Company.
 - 2. Dual Lock Partition Systems, Inc.
 - 3. Frameworks Manufacturing.
 - 4. Modulex, Inc.
 - 5. RACO Interior Products, Inc.
 - 6. Versatrac.

INTERIOR ALUMINUM FRAMES

7. Western Integrated Materials, Inc.**
8. Wilson Partitions.

2.2 COMPONENTS

- A. Aluminum Framing, General: **ASTM B 221 (ASTM B 221M)**, Alloy 6063-T5 or alloy and temper required to suit structural and finish requirements, not less than **0.062 inch (1.6 mm)** thick.
- B. Door Frames: Reinforced for hinges and strikes.
- C. Glazing Frames: For glazing thickness indicated.
- D. Ceiling Tracks: Extruded aluminum.
- E. Trim: Extruded aluminum, not less than **0.062 inch (1.6 mm)** thick, with removable snap-in casing trim without exposed fasteners.

2.3 ACCESSORIES

- A. Fasteners: Aluminum, nonmagnetic stainless-steel or other noncorrosive metal fasteners compatible with frames, stops, panels, reinforcement plates, hardware, anchors, and other items being fastened.
- B. Sound Seals: Manufacturer's standard continuous mohair, wool pile, or vinyl seals.
- C. Smoke Seals: Intumescent strip or fire-rated gaskets.
- D. Glazing Gaskets: Manufacturer's standard extruded or molded plastic, to accommodate glazing thickness indicated.
- E. Glazing: Comply with requirements in Division 8 Section "Glazing."
- F. Hardware: Comply with requirements in Division 8 door hardware Sections.

2.4 FABRICATION

- A. Machine jambs and prepare for hardware, with concealed reinforcement plates, drilled and tapped as required, and fastened within frame with concealed screws.
- B. Provide concealed corner reinforcements and alignment clips for accurately fitted hairline joints at butted or mitered connections.
- C. Fabricate frames for glazing with removable stops to allow glazing replacement without dismantling frame.
- D. Fabricate all components to allow secure installation without exposed fasteners.

2.5 ALUMINUM FINISHES

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- C. Baked-Enamel Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Apply baked enamel complying with paint manufacturer's written instructions for cleaning, conversion coating, and painting.
 - 1. Organic Coating: Thermosetting, modified-acrylic enamel primer/topcoat system complying with AAMA 2603 except with a minimum dry film thickness of **1.0 mils (0.025 mm)**, medium gloss.
 - 2. Color: Match Architect's sample.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls, floors, and ceilings, with Installer present, for conditions affecting performance of work.
 - 1. Verify that wall thickness does not exceed standard tolerances allowed by throat size indicated.
 - 2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with frame manufacturer's written installation instructions.
- B. Install frames plumb and square, securely anchored to substrates.
- C. Install frame components in the longest possible lengths; components up to 72 inches (1830 mm) long must be 1 piece.
 - 1. Fasten to suspended ceiling grid on maximum **48-inch (1220-mm)** centers, using sheet metal screws or other fasteners approved by frame manufacturer.
 - 2. Use concealed installation clips to produce tightly fitted and aligned splices and connections.
 - 3. Secure clips to main structural extrusion components and not to snap-in or trim members.
 - 4. Do not leave screws or other fasteners exposed to view when installation is complete.

3.3 CLEANING

- A. Clean exposed frame surfaces promptly after installation, using cleaning methods recommended by frame manufacturer and according to AAMA 609 & 610.

- B. Touch up marred frame surfaces so touchup is not visible from a distance of 24 inches (610 mm). Remove and replace frames with damaged finish that cannot be satisfactorily repaired.

- END OF SECTION -

- SECTION 08 1416 -**FLUSH WOOD DOORS**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Solid-core doors with wood-veneer faces.
 - 2. Factory finishing flush wood doors where doors are indicated to be stained.
 - 3. Factory fitting flush wood doors to frames and factory machining for hardware.

1.3 RELATED SECTIONS

- A. Section 01 74 19 "Materials Recycling & Waste Management".
- B. Section 01 81 13 "LEED Certification Requirements".
- C. Section 08 1113 "Hollow Metal Doors & Frames" for installation in metal frames as scheduled, or required by acoustics and fire rating.
- D. Section 08 7111 "Door Hardware" for coordination of hardware installation.
- E. Section 09 2900 "Gypsum Board" for coordination of installation.

1.4 SUBMITTALS

- A. Product Data: For each type of door, including details of core and edge construction, trim for openings, and factory-finishing specifications.
- B. LEED Submittal: See Section 018113 LEED Certification Requirements for the following:
 - 1. Certificates for Credit MR 7: Chain-of-custody certificates certifying that flush wood doors comply with forest certification requirements. Include evidence that manufacturer is certified for chain of custody by an FSC-accredited certification body.
 - a. Include statement indicating costs for each certified wood product.
 - 2. Product Data for Credit EQ 4.4: For adhesives and composite wood products, documentation indicating that product contains no urea formaldehyde

3. EQc4.1 Adhesives & Sealants: Product data for adhesives & sealants, including printed statement of VOC content and chemical components.
 4. MRc4 Recycled Content: Product data for products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content.
 - a. Include cost information for each product having recycled content.
 5. MRc5 Regional Materials:
 - a. Sourcing location(s): indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery from the project site.
 - b. Manufacturing location(s): indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
 - c. Product Value: indicate dollar value of product containing regional materials; include materials costs only.
 - d. Product Component(s) Value: Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.
- C. Shop Drawings: Indicate location and size of each door, elevation of each kind of door, details of construction, location and extent of hardware blocking, fire ratings, requirements for veneer matching and factory finishing and other pertinent data.
1. For factory-machined doors, indicate dimensions and locations of cutouts for locksets and other cutouts adjacent to light openings.
- D. Samples for verification in the form and size indicated below:
1. Finish sample with same materials proposed for factory-finished doors to match Architects Sample.

1.5 QUALITY ASSURANCE

- A. Fire-Rated Wood Doors: Provide wood doors which are identical in materials and construction to units tested in door and frame assemblies in accordance NFPA 252 and which are labeled and listed for ratings indicated by ITS – Warnock Hersey, UL or other testing and inspection agency acceptable to authorities having jurisdiction.
 1. Doors: Comply with UBC 7-2 where required.
 2. Provide intumescent requirements in compliance with UL-10C.
- B. WDMA I.S. 1-A 1997 Quality Standard: Window and Door Manufacturers Association Quality Standards for grade of door, core, construction, finish, and other requirements.
- C. Quality Inspection: Provide one additional extra heavy duty, heavy duty, standard duty and hollow core door for inspection purposes. The architect will choose one door, of each type, at random, to "Tear Down" and inspect for door construction compliance with the project specification (veneer thickness, core material, stile & rail size & material, blocking, etc.). These doors shall be included in the wood door supplier's base price on the date that the project bids.
- D. Forest Certification: Provide doors made with veneers obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."

FLUSH WOOD DOORS

- E. Provide core with option of acquiring LEED credit towards the following categories:
 1. MR 4.1 and 4.2 - Recycled Material
 2. MR 5.1 - Regional Materials (Manufactured within 500 miles jobsite)
 3. MR 6.0 – Rapidly Renewable
 4. EQ 4.4 – Low Emitting Materials
- F. Temperature Rise Rating: At stairwell enclosures, provide doors which have Temperature Rise Rating of 250 degrees F maximum in 30 minutes of fire exposure.
- G. Single-Source Responsibility: Obtain doors from one source and by a single manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect doors during transit, storage, and handling to prevent damage, soiling, and deterioration. Comply with requirements of referenced standard and manufacturer's instructions.
- B. Identify each door with individual opening numbers as designated on shop drawings, using temporary, removable, or concealed markings.

1.7 PROJECT CONDITIONS

- A. Conditioning: Do not deliver or install doors until conditions for temperature and relative humidity have been stabilized and will be maintained in storage and installation areas during the remainder of the construction period to comply with the following requirements applicable to Project's geographical location:
 1. AWI Quality Standard Section 100-S-11 "Relative Humidity and Moisture Content."

1.8 WARRANTY

- A. General Warranty: Warranties shall be in addition to, and not a limitation of, other rights the Owner may have under requirements of the Contract Documents.
- B. Door Manufacturer's Warranty: Submit written agreement on door manufacturer's standard form signed by manufacturer, Installer, and Contractor, agreeing to repair or replace defective doors that have warped (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section or that show telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span, or do not conform to tolerance limitations of referenced quality standards.
 1. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors where defect was not apparent prior to hanging.
 2. Warranty shall be in effect during the following period of time after date of Substantial Completion.
 - a. Solid Core Interior Doors: Life of installation.
- C. Contractor's Responsibilities: Replace and refinish doors where Contractor's work contributed to rejection or to voiding of manufacturer's warranty.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Manufacturers: Subject to exact compliance with requirements, provide products by one of the following:
1. Graham Manufacturing
 2. Eggers Industries
 3. Algoma Hardwoods
 4. VT Industries
 5. Marshfield Doors

2.2 DOOR CONSTRUCTION, GENERAL

- A. Low-Emitting Materials: Provide doors that comply with VOC requirements and made with adhesives and composite wood products that do not contain urea formaldehyde.
- B. WDMA I.S.1-A Performance Grade:
1. Heavy Duty unless otherwise indicated.
 2. Extra Heavy Duty: Classrooms, public toilets, janitor's closets, assembly spaces and exits.
- C. Particleboard-Core Doors:
1. Particleboard: ANSI A208.1, Grade LD-2, made with binder containing no urea-formaldehyde resin.
 2. Blocking: Provide wood blocking in particleboard-core doors as needed to eliminate through-bolting hardware.
 3. Provide doors with structural-composite-lumber cores instead of particleboard cores for doors indicated to receive exit devices.
- D. Structural-Composite-Lumber-Core Doors:
1. Structural Composite Lumber: WDMA I.S.10.
 - a. Screw Withdrawal, Face: 700 lbf (3100 N).
 - b. Screw Withdrawal, Edge: 400 lbf (1780 N).
- E. Fire-Protection-Rated Doors: Provide core specified or mineral core as needed to provide fire-protection rating indicated.
1. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.
 2. Pairs: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.
 3. Pairs: Provide formed-steel edges and astragals with intumescent seals.
 - a. Finish steel edges and astragals to match door hardware (locksets or exit devices).

FLUSH WOOD DOORS

- F. Mineral-Core Doors:
1. Core: Noncombustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire-protection rating indicated.
 2. Blocking: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated as follows:
 - a. 5-inch (125-mm) top-rail blocking.
 - b. 5-inch (125-mm) bottom-rail blocking, in doors indicated to have protection plates.
 - c. 5-inch (125-mm) midrail blocking, in doors indicated to have armor plates.
 - d. 5-inch (125-mm) midrail blocking, in doors indicated to have exit devices.
 3. Edge Construction: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.

2.3 DOORS FOR TRANSPARENT FINISH

- A. Door face veneers shall meet HPVA Premium "A" grade quality standards conforming to WDMA I.S. 1-A for transparent or semi-transparent finish. Minimum face veneer thickness shall be 1/50" at 12% moisture content after finish sanding.
- B. Species: White Maple.
- C. Face Cut: Plain sliced.
- D. Face Assembly: Book Match
- E. Face Symmetry: Center Balanced Match.
- F. Pairs, Sets & Transoms: Matched

2.4 FLUSH WOOD DOOR MATERIALS

- A. Fire Rated Doors: Thickness: 1-3/4 inches, interior flush wood, bonded, solid core conforming to WDMA I.S. 1-A 1997 and the following;
 1. Adhesives: Do not use adhesives containing urea formaldehyde.
 2. Core: bonded mineral core (FD) conforming to WDMA I.S. 1-A 1997.
 3. Door construction shall conform to WDMA I.S. 1-A 1997 Premium Grade requirements.
 4. Stiles: Hardwood to match face veneer over mineral composite, glued to core.
 5. Rails: Mineral composite as required by fire door authorities. Top and bottom: as required by manufacturer's fire door authorities.
 6. Facing: Hardboard Faces: AHA A135.4, Class 1 (tempered) or Class 2 (standard)..
 7. Construction: Five plies. Stiles and rails are bonded to core, then entire unit abrasive planed before veneering. Faces are bonded to core using a hot press.
 8. Where UBC 7-2-1997 requirements for positive pressure must be met, doors shall include all requirements as part of the door construction per 'Category A' guidelines as published by ITS/Warnock-Hersey. No intumescent is allowed on the frame. Only smoke gasketing applied around the perimeter of the frame to meet the 'S' smoke rating is permissible in instances where smoke control is required.

B. ANSI / WDMA I.S. 1-A Performance Duty Level: Extra Heavy Duty per WDMA Standards.

Performance Attributes Table	EXTRA HEAVY DUTY	HEAVY DUTY	STANDARD DUTY
Adhesive Bond Durability WDMA TM-6	Type II	Type II	Type II
Cycle Slam WDMA TM-7	1,000,000 Cycles	500,000 Cycles	250,000 Cycles
Hinge Loading WDMA TM-8	550 lbs.	475 lbs.	400 lbs.
Door Finishes Various ASTM test methods	TR-6/OP-6	TR-4/OP-4	TR-2/OP-2
Screwholding WDMA TM-10			
Door Face (unblocked)	550 lbs.	475 lbs.	400 lbs.
Door Face (optional blocking)	700 lbs.	700 lbs.	700 lbs.
Vertical Door Edge	500 lbs.	475 lbs.	400 lbs.
Horizontal Door Edge	300 lbs.	240 lbs.	180 lbs.
Telegraph WDMA T-1	Maximum 0.010in. Per 3 in. span		
Warp Tolerance WDMA T-2	Maximum 0.25 in. per 3'-6" x 7'-0" door section		
Squareness WDMA T-3	Diagonal Variance 0.125 in.		

C. Adhesives

1. Adhesives:
 - a. Do not use adhesives containing urea formaldehyde.
 - b. Face to core adhesives shall be Type I or Type II as appropriate for location in building. Adhesives must be classified Type I or Type II per WDMA TM-6 "Adhesive Bond Test Method." Type I adhesives shall be used for doors in exterior applications, Type II adhesives shall be used for doors in interior applications.

2.5 FACTORY FINISHING

- A. Comply with referenced WDMA Section G-15, "Factory Finishing."
- B. Pre-finish wood doors at factory.
- C. Transparent Finish: Match finish indicated in WDMA Section G-17: WDMA System #6.
- D. Honey toned maple color to match district standards and Architect's sample.

2.6 ACCESSORIES

- A. Vision Frames:
 1. Non-rated doors: Flush wood frames, hardwood to match facing.
 2. 20 minute fire rated doors: Provide manufacturer's tested metal clip or comparable system with wood stop appearance.
 3. Fire-rated doors: ITS – Warnock Hersey or UL approved glazing system.
 4. Glass: Refer to Section 08 8000 for glass types.

FLUSH WOOD DOORS

2.7 FABRICATION

- A. Fabricate wood doors in accordance with requirements of WDMA I.S. 1-A 1997 Quality Standards.
- B. Fabricate fire rated doors in accordance with requirements of ITS – Warnock Hersey or Underwriters' Laboratories, with metal label on each door including UL-10C.
- C. Fabricate doors with WDMA Quality Standards hardware blocking options as follows:
 - 1. Provide HB-1 – head and HB-2 – sill rails and HB-4 – lock block on all doors.
 - 2. Provide HB-6 only when exit devices are specified for door.
 - 3. Provide HB-8 for pivots or when floor bolts are specified under Section 08 7111 – Door Hardware.
- D. Provide doors with minimum ¼ inch thick edge strips, of wood species to match face veneers except as required for fire rating.
- E. Make cut-outs and provide stops for glass and louvers. Install metal door louvers. Seal cut-outs prior to installation of moldings.
 - 1. For full light doors: Provide cut out from flush wood door, with vertical grain direction.
- F. Bevel lock and hinge edges of single acting doors 3 degrees or 1/8 inch in 2 inches. Radius strike edge of double acting swing doors as required by pivot hinge manufacturer.
- G. Prepare doors to receive hardware. Refer to Section 08 7111 “Door Hardware” and NFPA 80 for hardware requirements including UL-10C.
 - 1. Prefit and bevel to net opening size less approximately 1/4 inch in width on single swing doors 3/16 inch in width for paired doors. Provide 1/4 inch clearance above finished floor, unless otherwise indicated on drawings. Provide 1/8 inch clearance at top of door.
 - 2. Slightly ease vertical edges.
- H. Fire Rated Pair of Doors; greater than 20 minute: Supply overlapping astragals or metal edge sets only as required by NFPA 80 1999 or by door manufacturer's fire door authorities. If an astragal is required, to comply with fire rated labeling requirements for pairs of fire rated doors, provide door manufacturer's standard tested astragal.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Examine installed door frames before hanging doors.
- B. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with plumb jambs and level heads.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Handle doors in accordance with recommendations of WDMA I.S. 1-A, "Care and Installation at Job Site."
- B. Condition doors to average temperature and humidity in area of installation for not less than 48 hours prior to installation. Store doors per recommendations of WDMA I.S. 1-A, "Care and Installation at Job Site."
- C. Install in neat and workmanlike manner, free from hammer or tool marks, open joints or slivers.
- D. Set plumb, level, square and true. Install work after building humidity is at acceptable level.
- E. Remove and replace all doors found to be warped, twisted, bowed, or otherwise damaged. Do not install doors which cannot be properly fitted to frames.
- F. Adjust prefinished doors and hardware and other moving or operating parts to function smoothly and correctly.
- G. Ensure that smoke gaskets are in-place before prefinished door installation.
- H. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

3.3 ADJUSTING AND PROTECTION

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. Finished Doors: Refinish or replace doors damaged during installation.
- C. Protect doors as recommended by door manufacturer to ensure that wood doors will be without damage or deterioration at the time of Substantial Completion.

- END OF SECTION -

- SECTION 08 1613 -

FRP FLUSH 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. Fiberglass reinforced polyester (FRP) flush doors.

1.3 RELATED SECTIONS

- A. Section 01 74 19 "Materials Recycling & Waste Management".
- B. Section 01 81 13 "LEED Certification Requirements".
- C. Section 08 1113 "Hollow Metal Doors and Frames" for installation in metal frames as scheduled, or required by acoustics and fire rating.
- D. Section 08 7111 "Door Hardware" for coordination of hardware installation.
- E. Section 09 2900 "Gypsum Board" for coordination of installation.

1.4 REFERENCES

- A. AAMA 1503-98 - Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections.
- B. ANSI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors and Hardware Reinforcings.
- C. ASTM B 117 - Operating Salt Spray (Fog) Apparatus.
- D. ASTM B 209 - Aluminum and Aluminum-Alloy Sheet and Plate.
- E. ASTM B 221 - Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- F. ASTM D 256 - Determining the Pendulum Impact Resistance of Notched Specimens of Plastics.

- G. ASTM D 543 - Evaluating the Resistance of Plastics to Chemical Reagents.
- H. ASTM D 570 - Water Absorption of Plastics.
- I. ASTM D 638 - Tensile Properties of Plastics.
- J. ASTM D 790 - Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
- K. ASTM D 1308 - Effect of Household Chemicals on Clear and Pigmented Organic Finishes.
- L. ASTM D 1621 - Compressive Properties of Rigid Cellular Plastics.
- M. ASTM D 1623 - Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics.
- N. ASTM D 2126 - Response of Rigid Cellular Plastics to Thermal and Humid Aging.
- O. ASTM D 2583 - Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor.
- P. ASTM D 5420 - Impact Resistance of Flat Rigid Plastic Specimens by Means of a Falling Weight.
- Q. ASTM D 6670-01 - Standard Practice for Full-Scale Chamber Determination of Volatile Organic Emissions from Indoor Materials/Products.
- R. ASTM E 84 - Surface Burning Characteristics of Building Materials.
- S. ASTM E 90 - Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions.
- T. ASTM E 283 - Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
- U. ASTM E 330 - Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
- V. ASTM E 331 - Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
- W. ASTM F 476 - Security of Swinging Door Assemblies.
- X. NWWDA T.M. 7-90 - Cycle Slam Test Method
- Y. SFBC PA 201 - Impact Test Procedures.
- Z. SFBC PA 203 - Criteria for Testing Products Subject to Cyclic Wind Pressure Loading.
- AA. SFBC 3603.2 (b) (5) - Forced Entry Resistance Test.

1.5 PERFORMANCE REQUIREMENTS

- A. General: Provide door assemblies that have been designed and fabricated to comply with specified performance requirements, as demonstrated by testing manufacturer's corresponding standard systems.
- B. Air Infiltration: For a single door 3'-0" x 7'-0", test specimen shall be tested in accordance with ASTM E 283 at pressure differential of 6.24 psf. Door shall not exceed 0.90 cfm per linear foot of perimeter crack.
- C. Water Resistance: For a single door 3'-0" x 7'-0", test specimen shall be tested in accordance with ASTM E 331 at pressure differential of 7.50 psf. Door shall not have water leakage.
- D. Indoor air quality testing per ASTM D 6670-01: GREENGUARD Environmental Institute Certified including GREENGUARD for Children and Schools Certification.
- E. Hurricane Test Standards, Single Door with Single-Point Latching:
 - 1. Uniform Static Load, ASTM E 330: Plus or minus 75 pounds per square foot.
 - 2. Forced Entry Test, 300 Pound Load Applied, SFBC 3603.2 (b) (5): Passed.
 - 3. Cyclic Load Test, SFBC PA 203: Plus or minus 53 pounds per square foot.
 - 4. Large Missile Impact Test, SFBC PA 201: Passed.
- F. Swinging Door Cycle Test, Doors and Frames, ANSI A250.4: Minimum of 25,000,000 cycles.
- G. Cycle Slam Test Method, NWWDA T.M. 7-90: Minimum 5,000,000 Cycles.
- H. Swinging Security Door Assembly, Doors and Frames, ASTM F 476: Grade 40.
- I. Salt Spray, Exterior Doors and Frames, ASTM B 117: Minimum of 500 hours.
- J. Sound Transmission, Exterior Doors, STC, ASTM E 90: Minimum of 25.
- K. Thermal Transmission, Exterior Doors, U-Value, AAMA 1503-98: Maximum of 0.29 BTU/hr x sf x degrees F. Minimum of 55 CRF value.
- L. Surface Burning Characteristics, FRP Doors and Panels, ASTM E 84:
 - 1. Flame Spread: Maximum of 200, Class C.
 - 2. Smoke Developed: Maximum of 450, Class C.
- M. Surface Burning Characteristics, Class A Option On Interior Faces of FRP Exterior Panels and Both Faces of FRP Interior Panels, ASTM E 84:
 - 1. Flame Spread: Maximum of 25.
 - 2. Smoke Developed: Maximum of 450.
- N. Impact Strength, FRP Doors and Panels, Nominal Value, ASTM D 256: 15.0 foot-pounds per inch of notch.
- O. Tensile Strength, FRP Doors and Panels, Nominal Value, ASTM D 638: 14,000 psi.
- P. Flexural Strength, FRP Doors and Panels, Nominal Value, ASTM D 790: 21,000 psi.

- Q. Water Absorption, FRP Doors and Panels, Nominal Value, ASTM D 570: 0.20 percent after 24 hours.
- R. Indentation Hardness, FRP Doors and Panels, Nominal Value, ASTM D 2583: 55.
- S. Gardner Impact Strength, FRP Doors and Panels, Nominal Value, ASTM D 5420: 120 in-lb.
- T. Abrasion Resistance, Face Sheet, Taber Abrasion Test, 25 Cycles at 1,000 Gram Weight with CS-17 Wheel: Maximum of 0.029 average weight loss percentage.
- U. Stain Resistance, ASTM D 1308: Face sheet unaffected after exposure to red cabbage, tea, and tomato acid. Stain removed easily with mild abrasive or FRP cleaner when exposed to crayon and crankcase oil.
- V. Chemical Resistance, ASTM D 543. Excellent rating.
 - 1. Acetic acid, Concentrated.
 - 2. Ammonium Hydroxide, Concentrated.
 - 3. Citric Acid, 10%.
 - 4. Formaldehyde.
 - 5. Hydrochloric Acid, 10%
 - 6. Sodium hypochlorite, 4 to 6 percent solution.
- W. Compressive Strength, Foam Core, Nominal Value, ASTM D 1621: 79.9 psi.
- X. Compressive Modulus, Foam Core, Nominal Value, ASTM D 1621: 370 psi.
- Y. Tensile Adhesion, Foam Core, Nominal Value, ASTM D 1623: 45.3 psi.
- Z. Thermal and Humid Aging, Foam Core, Nominal Value, 158 Degrees F and 100 Percent Humidity for 14 Days, ASTM D 2126: Minus 5.14 percent volume change.

1.6 SUBMITTALS

- A. Comply with Section 01 3219 - Submittal Procedures.
- B. Product Data: Submit manufacturer's product data, including description of materials, components, fabrication, finishes, and installation.
- C. LEED Submittal: See Section 018113 LEED Certification Requirements for the following:
 - 1. MRc4 Recycled Content: Product data for products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content.
 - a. Include cost information for each product having recycled content.
 - 2. MRc5 Regional Materials:
 - a. Sourcing location(s): indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery from the project site.
 - b. Manufacturing location(s): indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.

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- c. Product Value: indicate dollar value of product containing regional materials; include materials costs only.
 - d. Product Component(s) Value: Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.
3. EQc4.2 Paints & Coatings: Product data for paints & coatings, including printed statement of VOC content and chemical components.
- D. Shop Drawings: Submit manufacturer's shop drawings, including elevations, sections, and details, indicating dimensions, tolerances, materials, fabrication, doors, panels, framing, hardware schedule, and finish.
- E. Samples:
- 1. Door: Submit manufacturer's sample of door showing face sheets, core, framing, and finish.
 - 2. Color: Submit manufacturer's samples of standard colors of doors and frames.
- F. Test Reports: Submit certified test reports from qualified independent testing agency indicating doors comply with specified performance requirements.
- G. Maintenance Manual: Submit manufacturer's maintenance and cleaning instructions for doors, including maintenance and operating instructions for hardware.
- H. Warranty: Submit manufacturer's standard warranty.

1.7 QUALITY ASSURANCE

- A. Manufacturer's Qualifications:
- 1. Continuously engaged in manufacturing of doors of similar type to that specified, with a minimum of 25 years successful experience.
 - 2. Door and frame components from same manufacturer.
 - 3. Evidence of a compliant documented quality management system.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying opening door mark and manufacturer.
- B. Storage: Store materials in clean, dry area indoors in accordance with manufacturer's instructions.
- C. Handling: Protect materials and finish from damage during handling and installation.

1.9 WARRANTY

- A. Warrant doors, frames, and factory hardware against failure in materials and workmanship, including excessive deflection, faulty operation, defects in hardware installation, and deterioration of finish or construction in excess of normal weathering.

- B. Warranty Period: Ten years starting on date of shipment. In addition, a limited lifetime (while the door is in its specified application in its original installation) warranty covering failure of corner joinery, core deterioration, delamination or bubbling of door skin.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Special-Lite, Inc., PO Box 6, Decatur, Michigan 49045. Tel: (800) 821-6531. Fax (800) 423-7610, www.special-lite.com.

2.2 FRP FLUSH DOORS

- A. Model: SL-17 Flush Doors with SpecLite3 fiberglass reinforced polyester (FRP) face sheets.
- B. Door Opening Size: As indicated on the Drawings.
- C. Construction:
 - 1. Door Thickness: 1-3/4 inches.
 - 2. Stiles and Rails: Aluminum Alloy 6063-T5, minimum of 2-5/16-inch depth.
 - 3. Corners: Mitered.
 - 4. Provide joinery of 3/8-inch diameter full-width tie rods through extruded splines top and bottom as standard tubular shaped stiles and rails reinforced to accept hardware as specified.
 - 5. Securing Internal Door Extrusions: 3/16-inch angle blocks and locking hex nuts for joinery. Welds, glue, or other methods are not acceptable.
 - 6. Furnish extruded stiles and rails with integral reglets to accept face sheets. Lock face sheets into place to permit flush appearance.
 - 7. Rail caps or other face sheet capture methods are not acceptable.
 - 8. Extrude top and bottom rail legs for interlocking continuous weather bar.
 - 9. Meeting Stiles: Pile brush weatherseals. Extrude meeting stile to include integral pocket to accept pile brush weatherseals.
 - 10. Bottom of Door: Install bottom weather bar with nylon brush weatherstripping into extruded interlocking edge of bottom rail.
 - 11. Glue: Use of glue to bond sheet to core or extrusions is not acceptable.
- D. Face Sheet:
 - 1. Material: SpecLite3 FRP, 0.120-inch thickness, finish color throughout.
 - 2. Protective coating: Abuse-resistant engineered surface.
 - 3. Texture: Pebble.
 - 4. Colors: As selected by Architect.
 - 5. Adhesion: The use of glue to bond face sheet to foam core is prohibited.
- E. Core:
 - 1. Material: Poured-in-place polyurethane foam.
 - 2. Density: Minimum of 5 pounds per cubic foot.

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3. R-Value: Minimum of 9.

F. Cutouts:

1. Manufacture doors with cutouts for required vision lites, louvers and panels.
2. Factory install vision lites, louvers and panels.

G. Hardware:

1. Premachine doors in accordance with templates from specified hardware manufacturers and hardware schedule.
2. SL-11HD continuous hinges
3. Factory install hinges, locksets and panic hardware.

2.3 MATERIALS

A. Aluminum Members:

1. Extrusions: ASTM B 221.
2. Sheet and Plate: ASTM B 209.
3. Alloy and Temper: As required by manufacturer for strength, corrosion resistance, application of required finish, and control of color.

B. Components: Door and frame components from same manufacturer.

C. Fasteners:

1. Material: Aluminum, 18-8 stainless steel, or other noncorrosive metal.
2. Compatibility: Compatible with items to be fastened.
3. Exposed Fasteners: Screws with finish matching items to be fastened.

2.4 FABRICATION

A. Sizes and Profiles: Required sizes for door and frame units, and profile requirements shall be as indicated on the Drawings.

B. Coordination of Fabrication: Field measure before fabrication and show recorded measurements on shop drawings.

C. Assembly:

1. Complete cutting, fitting, forming, drilling, and grinding of metal before assembly.
2. Remove burrs from cut edges.

D. Welding: Welding of doors or frames is not acceptable.

E. Fit:

1. Maintain continuity of line and accurate relation of planes and angles.
2. Secure attachments and support at mechanical joints with hairline fit at contacting members.

2.5 ARCHITECTURAL PANELS

- A. FRP Panels:
 - 1. Model: SL-37 Architectural Panels with SpecLite3 FRP face sheets.
 - 2. Thickness: 1 inch.
- B. Face Sheets:
 - 1. Material: SpecLite3 FRP, 0.120 inch thickness, finish color throughout. Abuse-resistant engineered surface.
 - 2. Texture: Pebble.
 - 3. Color: As selected by Architect.
- C. Insulated SpecLite3 FRP Panels:
 - 1. Insulated Panels: Two 0.120 inch minimum thickness sheets.
 - 2. Core: Foam polyurethane core of a minimum of 5 pounds per cubic foot density.
 - 3. Form components to function as a single unit.
 - 4. R-Value: Minimum of 4 for 1 inch panels.
- D. Class A Flame Spread and Smoke Developed Rating:
 - 1. Class A flame spread and smoke developed rating on interior faces of exterior panels and both faces of interior panels.
 - 2. Flame Spread, ASTM E 84: Maximum of 25.
 - 3. Smoke Developed, ASTM E 84: Maximum of 450.

2.6 HARDWARE

- A. Premachine doors in accordance with templates from specified hardware manufacturers and hardware schedule.
- B. Factory install hinges, locksets and panic hardware.
- C. Hardware Schedule: As specified in Section 08 7111.
- D. Finish: As specified in Section 08 7111.

2.7 VISION LITES

- A. Factory Glazing: 1 inch glass.
- B. Lites in Exterior Doors: Allow for thermal expansion.
- C. Provide door manufacturer's standard lite kits, factory installed.

2.8 ALUMINUM FINISHES

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

FRP FLUSH DOORS

- 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.
- C. Color Anodic Finish: AAMA 611, AA-M12C22A32/A34, Class II, 0.010 mm or thicker.
 - 1. Color: Dark bronze.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive doors. Notify Architect of conditions that would adversely affect installation or subsequent use. Do not proceed with installation until unsatisfactory conditions are corrected.

3.2 PREPARATION

- A. Ensure openings to receive frames are plumb, level, square, and in tolerance.

3.3 INSTALLATION

- A. Install doors in accordance with manufacturer's instructions.
- B. Install doors plumb, level, square, true to line, and without warp or rack.
- C. Anchor frames securely in place.
- D. Separate aluminum from other metal surfaces with bituminous coatings or other means approved by Architect.
- E. Set thresholds in bed of mastic and backseal.
- F. Install exterior doors to be weathertight in closed position.
- G. Repair minor damages to finish in accordance with manufacturer's instructions and as approved by Architect.
- H. Remove and replace damaged components that cannot be successfully repaired as determined by Architect.

3.4 ADJUSTING

- A. Adjust doors, hinges, and locksets for smooth operation without binding.

3.5 CLEANING

- A. Clean doors promptly after installation in accordance with manufacturer's instructions.

- B. Do not use harsh cleaning materials or methods that would damage finish.

3.6 PROTECTION

- A. Protect installed doors to ensure that, except for normal weathering, doors will be without damage or deterioration at time of substantial completion.

- END OF SECTION -

- SECTION 08 3113 -**ACCESS DOORS & FRAMES**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Access doors and frames for walls and ceilings.
 - 2. Wall access doors and frames
 - 3. Fire-rated wall access doors and frames.
 - 4. Fire-rated ceiling access doors and frames.

1.3 RELATED SECTIONS

- A. Section 01 74 19 "Materials Recycling & Waste Management".
- B. Section 01 81 13 "LEED Certification Requirements".
- C. Section 07 7200 "Roof Accessories" for roof hatches.
- D. Section 08 7111 "Door Hardware" for mortise or rim cylinder locks and master keying.
- E. Section 09 2710 "Glass-Reinforced Gypsum Fabrications" for flush push up ceiling access panels in suspended gypsum board ceilings.
- F. Section 09 5113 "Acoustical Tile Ceilings" for suspended acoustical tile ceilings.
- G. Section 23 3000 "Ductwork Accessories" for heating and air-conditioning duct access doors.

1.4 SUBMITTALS

- A. Product Data: For each type of access door and frame indicated. Include construction details, fire ratings, materials, individual components and profiles, and finishes.

- B. LEED Submittal: See Section 018113 LEED Certification Requirements for the following:
 - 1. MRc4 Recycled Content: Product data for products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content.
 - a. Include cost information for each product having recycled content.
 - 2. MRc5 Regional Materials:
 - a. Sourcing location(s): indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery from the project site.
 - b. Manufacturing location(s): indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
 - c. Product Value: indicate dollar value of product containing regional materials; include materials costs only.
 - d. Product Component(s) Value: Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.
- C. Shop Drawings: Show fabrication and installation details of access doors and frames for each type of substrate. Include plans, elevations, sections, details, and attachments to other work.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of access door(s) and frame(s) through one source from a single manufacturer.
- B. Fire-Rated Access Doors and Frames: Units complying with NFPA 80 that are identical to access door and frame assemblies tested for fire-test-response characteristics per the following test method and that are listed and labeled by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
 - 1. NFPA 252 or UL 10B for vertical access doors and frames.
 - 2. ASTM E 119 or UL 263 for horizontal access doors and frames.
- C. Size Variations: Obtain Architect's acceptance of manufacturer's standard-size units, which may vary slightly from sizes indicated.

1.6 COORDINATION

- A. Verification: Determine specific locations and sizes for access doors needed to gain access to concealed plumbing, mechanical, or other concealed work, and indicate in the schedule specified in "Submittals" Article.

PART 2 - PRODUCTS

2.1 STEEL MATERIALS

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

ACCESS DOORS & FRAMES

1. ASTM A 123/A 123M, for galvanizing steel and iron products.
 2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.
- B. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.
1. ASTM A 123/A 123M, for galvanizing steel and iron products
 2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.
- C. Steel Sheet: Uncoated or electrolytic zinc-coated, ASTM A 591/A 591M with cold-rolled steel sheet substrate complying with ASTM A 1008/A 1008M, Commercial Steel (CS), exposed.
- D. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS) with A60 (ZF180) zinc-iron-alloy (galvannealed) coating or G60 (Z180) mill-phosphatized zinc coating; stretcher-leveled standard of flatness; with minimum thickness indicated representing specified thickness according to ASTM A 924/A 924M.
- E. Steel Finishes: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
1. Surface Preparation for Steel Sheet: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning," to remove dirt, oil, grease, or other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or SSPC-SP 8, "Pickling."
 2. Surface Preparation for Metallic-Coated Steel Sheet: Clean surfaces with nonpetroleum solvent so surfaces are free of oil and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint specified below to comply with ASTM A 780.
 - a. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.
 3. Factory-Primed Finish: Apply shop primer immediately after cleaning and pretreating.
 4. Powder-Coat Finish: Immediately after cleaning and pretreating, apply manufacturer's standard thermosetting polyester or acrylic urethane powder coating with cured-film thickness not less than 1.5 mils (0.04 mm). Prepare, treat, and coat metal to comply with resin manufacturer's written instructions.
- F. Drywall Beads: Edge trim formed from 0.0299-inch (0.76-mm) zinc-coated steel sheet formed to receive joint compound and in size to suit thickness of gypsum board.
- G. Plaster Beads: Casing bead formed from 0.0299-inch (0.76-mm) zinc-coated steel sheet with flange formed out of expanded metal lath and in size to suit thickness of plaster.

2.2 STAINLESS-STEEL MATERIALS

- A. Rolled-Stainless-Steel Floor Plate: ASTM A 793, manufacturer's standard finish.
- B. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 304. Remove tool and die marks and stretch lines or blend into finish.
1. Finish: Manufacturer's standard.

2.3 ALUMINUM MATERIALS

- A. Aluminum Extrusions: **ASTM B 221 (ASTM B 221M)**, Alloy 6063-T6.
 - 1. Mill finish, AA-M10 (Mechanical Finish: as fabricated, unspecified).
- B. Aluminum-Alloy Rolled Tread Plate: ASTM B 632/B 632M, Alloy 6061-T6.
 - 1. Mill finish, AA-M10 (Mechanical Finish: as fabricated, unspecified).
- C. Aluminum Sheet: **ASTM B 209 (ASTM B 209M)**, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than strength and durability properties of Alloy 5005-H15; with minimum sheet thickness indicated representing specified thickness according to **ANSI H35.2 (ANSI H35.2(M))**.
 - 1. Mill Finish: AA-M10 (Mechanical Finish: as fabricated, unspecified).

2.4 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Babcock-Davis; A Cierra Products Co.
 - 2. Dur-Red Products.
 - 3. J. L. Industries, Inc.
 - 4. Karp Associates, Inc.
 - 5. Larsen's Manufacturing Company.
 - 6. Milcor Inc.
 - 7. Nystrom, Inc.
- C. Flush Access Doors and Frames with Exposed Trim: Fabricated from stainless-steel sheet.
 - 1. Locations: Wall surfaces (Wet Areas).
 - 2. Door: Minimum **0.060-inch- (1.5-mm-)** thick sheet metal, set flush with exposed face flange of frame.
 - 3. Frame: Minimum **0.060-inch- (1.5-mm-)** thick sheet metal with **1-inch- (25-mm-)** wide, surface-mounted trim.
 - 4. Hinges: Spring-loaded, concealed-pin type.
 - 5. Latch: Self-latching bolt operated by ring turn with interior release.
 - 6. Lock: Cylinder.
- D. Flush Access Doors and Trimless Frames: Fabricated from metallic-coated steel sheet.
 - 1. Locations: Wall surfaces.
 - 2. Door: Minimum **0.060-inch- (1.5-mm-)** thick sheet metal, set flush with surrounding finish surfaces.
 - 3. Frame: Minimum **0.060-inch- (1.5-mm-)** thick sheet metal with drywall bead flange.
 - 4. Hinges: Spring-loaded, concealed-pin type.
 - 5. Latch: Self-latching bolt operated by screwdriver with interior release.

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- E. Plastic Flush Access Doors and Frames with Exposed Trim: Fabricated from **1/8-inch- (3.2-mm-)** thick high-impact plastic with UV stabilizer.
1. Locations: Ceiling surfaces.
 2. Door: Flush to frame with rounded corners.
 3. Frame: 1 piece, **3/4 inch (19 mm)** deep.
 4. Latch: Snap latch.
 5. Finish: White with textured exposed surfaces.
- F. Exterior Flush Access Doors and Frames with Exposed Trim: Weatherproof with extruded door gasket.
1. Locations: Wall and ceiling surfaces.
 2. Door: Minimum **0.040-inch- (1.0-mm-)** thick, metallic-coated steel sheet; flush panel construction with manufacturer's standard **2-inch- (50-mm-)** thick fiberglass insulation.
 3. Frame: Minimum **0.060-inch- (1.5-mm-)** thick extruded aluminum.
 4. Hinges: Continuous piano, zinc plated.
 5. Lock: Dual-action handles with key lock.
- G. Fire-Rated, Insulated, Flush Access Doors and Trimless Frames: Fabricated from metallic-coated steel sheet.
1. Locations: Wall and ceiling surfaces.
 2. Fire-Resistance Rating: Not less than that of adjacent construction.
 3. Temperature Rise Rating: **250 deg F (139 deg C)** at the end of 30 minutes.
 4. Door: Flush panel with a core of mineral-fiber insulation enclosed in sheet metal with a minimum thickness of **0.036 inch (0.9 mm)**.
 5. Frame: Minimum **0.060-inch- (1.5-mm-)** thick sheet metal with drywall bead.
 6. Hinges: Concealed-pin type Continuous piano.
 7. Automatic Closer: Spring type.
 8. Lock: Self-latching device with cylinder lock.

2.5 FABRICATION

- A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.
- B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
- C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of supports indicated.
1. Exposed Flanges: Nominal 1 to 1-1/2 inches (25 to 38 mm) wide around perimeter of frame.
 2. For trimless frames with drywall bead, provide edge trim for gypsum board and gypsum base securely attached to perimeter of frames.
 3. For trimless frames with plaster bead for full-bed plaster applications, provide zinc-coated expanded metal lath and exposed casing bead welded to perimeter of frames.

4. Provide mounting holes in frames for attachment of units to metal or wood framing.
 5. Provide mounting holes in frame for attachment of masonry anchors. Furnish adjustable metal masonry anchors.
- D. Recessed Access Doors: Form face of panel to provide recess for application of applied finish. Reinforce panel as required to prevent buckling.
1. For recessed doors with plaster infill, provide self-furring expanded metal lath attached to door panel.
- E. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.
1. For cylinder lock, furnish two keys per lock and key all locks alike.
 2. For recessed panel doors, provide access sleeves for each locking device. Furnish plastic grommets and install in holes cut through finish.
- F. Extruded Aluminum: After fabrication, apply manufacturer's standard protective coating on aluminum that will come in contact with concrete.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with manufacturer's written instructions for installing access doors and frames.
- B. Set frames accurately in position and attach securely to supports with plane of face panels aligned with adjacent finish surfaces.
- C. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

3.2 ADJUSTING AND CLEANING

- A. Adjust doors and hardware after installation for proper operation.
- B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

- END OF SECTION -

- SECTION 08 3213

- SLIDING DOORS

PART 1 – GENERAL

1.01 SUMMARY

- A. WORK INCLUDED: Furnish complete intensive care aluminum door system, as specified, that has been manufactured, fabricated and installed to maintain performance criteria stated by manufacturer without defects, damage or failure.
- B. RELATED WORK:
1. Storefront; Glass; Hardware: Division 8, applicable sections.
 2. Perimeter Sealants; Insulation: Division 7, applicable sections.

1.02 REFERENCES

- A. [AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION \(AAMA\) 101](#): Appendix Dissimilar Materials.
- B. [AMERICAN NATIONAL STANDARDS INSTITUTE \(ANSI\)](#): [ANSI Z97.1](#): Safety Glazing Materials Used in Buildings - Methods of Test.
- C. [AMERICAN SOCIETY FOR TESTING AND MATERIALS \(ASTM\) B221](#): Aluminum-Alloy Extruded Bars, Rods, Shapes and Tubes.
- D. [NATIONAL FIRE PROTECTION ASSOCIATION \(NFPA\) 101](#): Code for Safety to Life from Fire in Buildings & Structures.
- E. [THE ALUMINUM ASSOCIATION \(AA\)](#) Aluminum Finishes Manual.

1.03 SUBMITTALS

- A. PRODUCT DATA: Submit manufacturer's complete product and installation data.

B. SHOP DRAWINGS: Submit drawings showing layout, profiles, product components including anchorage, accessories, finish and glazing details (where required).

C. QUALITY ASSURANCE AND CLOSEOUT SUBMITTALS: Submit the following:

1. Manufacturer's Operation and Maintenance Data.
2. Warranty document as specified herein.

1.04 QUALITY ASSURANCE

A. INSTALLERS QUALIFICATIONS: Installer experienced as determined by contractor to perform work of this section who has specialized in the installation of work similar to that required for this project and who is acceptable to product manufacturer.

B. MANUFACTURER'S QUALIFICATIONS: Manufacturer to have minimum (5) five years successful experience in the fabrication of intensive care doors of the type required for this project. Manufacturer capable of providing field service representation during installation, approving acceptable installer and approving application method.

C. MANUFACTURER:

HORTON AUTOMATICS - PROFILER ICU MANUAL SLIDE DOORS - ICU

1.05 WARRANTIES

A. MANUFACTURER'S WARRANTY: Units to be warranted against defect in material and workmanship for a period of one year from the Date of Substantial Completion. Manufacturer's warranty is in addition to, and not a limitation of, other rights owner may have under Contract Documents.

B. DISTRIBUTOR'S WARRANTY: One year warranty: Labor and transportation charges for defective parts replacement.

1.06 PROJECT CONDITIONS

FIELD MEASUREMENTS : Verify actual dimensions/openings by field measurements before fabrication and record on shop drawings. Coordinate with

fabrication and construction schedule to avoid construction delays.

1.07 DELIVERY, STORAGE AND HANDLING

- A. ORDERING AND DELIVERY: Comply with factory's ordering instructions and lead time requirements. Delivery shall be in factory's original, unopened, undamaged containers with identification labels intact.
- B. STORAGE AND PROTECTION: Provide protection from exposure to harmful weather conditions and vandalism.

PART 2 – PRODUCTS

2.01 MANUFACTURER

HORTON AUTOMATICS, a division of Overhead Door Corporation, shall manufacture intensive care sliding door(s) of type(s) and size(s) specified on plans and door schedule.

2.02 EQUIPMENT

- A. MANUFACTURED DOOR UNITS: Shall include header and track, jambs, sliding door panel(s), and sidelite(s). Units can be mounted within rough opening with sliding panel(s) sliding along sidelite; also, units can be surface mounted with sliding panel(s) sliding along wall. Units will be either single-slide or biparting and will be one of the following unit types:
1. Type 010: Sliding panel(s) shall slide along interior side.
 2. Type 110: Slide-swing panel(s) shall slide along exterior side.
 3. Type 310: Slide-swing panel(s) shall slide along interior side. Swing-out sidelite.
 4. Type 310 Trackless: Slide-Swing panel(s) shall slide along interior side. Swing-out sidelite (door must be in full open position). No floor recess required.
 5. Telescoping Door Type 010T, 110T, or 310T: When unit slides in full open position, maximum slide opening will be approximately 70% of overall package

width.

B. HEADER: Shall be aluminum with removable face plate. Optional transom of size and type indicated mounted on header. Header sizes to be:

1. 4" (102 mm) deep by 2 1/2" (63 mm) high for Types 010, 110, and 310,
2. 7" (178 mm) deep by 2 1/2" (63 mm) high for Telescoping door types. Optional 6" (152 mm) deep for Types 010 and 110.
3. Optional Profiler™ header for all unit types: 4" (102 mm) deep by 6" (152 mm) high.

C. HEADER TRACK: Shall be aluminum, nylon covered and replaceable. Telescoping doors will have two separate tracks for sliding panels to travel. Rollers will be steel, high quality ball bearing wheels 1-1/4" (32 mm) diameter. Anti-Derailing shall be accomplished by means of a continuous aluminum extrusion full length of slide panel travel.

D. SLIDING PANEL(S) AND SIDELITE(S): Shall be aluminum, 1-3/4" (44 mm) deep with narrow stile construction. Weather-stripping to be along vertical rails of sliding panel(s) and swing-out sidelite(s). Concealed guides to stabilize bottom of sliding panel. Standard glazing prep to be for 1/4" (6 mm) glass.

1. Total weight limit per panel shall be:
 - a. 200 lbs. (90.7 kg) for slide panel (non-breakout)
 - b. 156 lbs. (70.7 kg) for UL listed slide-swing panel
2. Sliding Panel and Sidelite Options shall be:
 - a. Medium and wide stiles.
 - b. Additional and/or extra wide sidelites of size and type indicated.
 - c. Recessed sidelite and track and non-threshold application.
 - d. Horizontal muntin(s) of size and type indicated. Prep. for glazing 5/16" (16 mm) to 1" (25 mm).

E. EMERGENCY EGRESS:

1. Slide-swing panels and swing-out sidelites shall have torsion spring designed to re-close panel if pushed open in the direction of egress.

2. Breakout mechanism shall provide support across full width of the door, in normal operating mode. In breakout mode, torsion assembly shall support weight of the door to minimize drop during emergency egress.
3. Slide-swing panels shall include intermediate horizontal rail.
4. Units with emergency egress feature are UL listed as an exit way and are compliant with NFPA 101.

F. JAMBS/FRAME: Shall be aluminum. Jamb Dimensions to be:

1. 1 3/4" (44 mm) deep by 4" (102 mm) wide for Types 010, 110, & 310.
2. 1 3/4" (44 mm) deep by 7" (178 mm) wide for Telescoping door type 310T.
3. Optional jamb for Telescoping door types 010T and 110T: 1/4" (6 mm) deep by 7" (178 mm) wide or 6" (152 mm) wide.
4. Frame Option: Transom of size and type indicated mounted on header.

G. HARDWARE: A recessed pull shall be provided on each side of the sliding panel. No locks shall be provided. Exception: Trackless units shall include a flush bolt lock to lock the SO.

Option: Positive latching shall be provided as follows:

1. Type 110: The slide-swing panel shall be provided with positive latch that will latch this panel in place when closed. A lever handle shall be provided on each side of the sliding panel to unlock the door.
2. Type 310: The slide-swing panel shall be provided with positive latch that will latch this panel in place when closed. A lever handle shall be provided on each side of the sliding panel to unlock the door. The swing-out sidelite shall be provided with positive latch that will latch this panel in place when closed. A lever handle shall be provided on exterior side of sidelite to unlock the panel.

2.03 MATERIALS, FINISHES AND FABRICATION

A. EXTRUDED ALUMINUM: ASTM B221, 6063-T5 alloy and temper, anodized:

1. Structural Header Sections: Minimum 3/16" (5 mm) thickness.
2. Structural Frame Sections: Minimum 1/8" (3 mm) thickness.
3. Structural Panel Sections: Commercial grade.

B. FINISHES (for all exposed aluminum surfaces): Shall be the following:

1. Paint Coating: Alabaster White.

C. PANEL CONSTRUCTION:

1. Corner block type with 3/16" steel backup plate construction, mechanically secured with minimum of four hardened steel screws. Sash consists of snap-in glass stops, snap-in glazing beads and vinyl gaskets.
2. Weatherstripping material captured in extruded aluminum door panel. Door nosing weatherstrip to be spring-loaded adjustable astragal type. Surface applied self- adhesive weatherstripping not acceptable.
3. Slide-swing doors to be supplied with adjustable glass setting block to allow for adjusting of door to meet site conditions eliminating the need for additional shims.

D. FRAME CONSTRUCTION: Butt joints, mechanically secured by means of screws and formed aluminum corner brackets.

PART 3 - EXECUTION

3.01 EXAMINATION

SITE VERIFICATION OF CONDITIONS: Installer must verify that base conditions previously installed under other sections are acceptable for product installation according to with manufacturer's instructions. Notify the Contractor in writing of conditions detrimental to the proper and timely completion of work. Do not start work until all negative conditions are corrected in a manner acceptable to the installer and manufacturer.

3.02 INSTALLATION

A. GENERAL: Install door units plumb, level and true to line, without warp or rack of frames or sash with manufacturer's prescribed tolerances. Provide support and anchor in place.

B. DISSIMILAR MATERIALS: Comply with AAMA 101, Appendix Dissimilar

Materials by separating aluminum materials and other corrodible surfaces from sources of corrosion or electrolytic action contact points.

C. WEATHER-TIGHT CONSTRUCTION: Install header and framing members in a bed of sealant or with joint filler or gaskets. Coordinate installation with wall flashings and other components of construction.

3.03 CLEANING, ADJUSTMENT AND PROTECTION

A. CLEANING: After installation, installer to take following steps:

1. Remove temporary coverings and protection of adjacent work areas.
2. Remove construction debris from construction site and legally dispose of debris.
3. Repair or replace damaged installed products.
4. Clean product surfaces and lubricate operating equipment for optimum condition and safety.

B. ADVISE CONTRACTOR: Of precautions required through the remainder of the construction period, to ensure that doors will be without damage or deterioration (other than normal weathering) at the time of acceptance.

END OF SECTION

- SECTION 08 3323 -

OVERHEAD COILING DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following types of overhead coiling doors:
 - 1. Factory finished Counter doors.
 - 2. Factory finished Fire-rated counter doors.
 - 3. Service doors.

1.3 RELATED SECTIONS

- A. Section 01 74 19 "Materials Recycling & Waste Management".
- B. Section 01 81 13 "LEED Certification Requirements".
- C. Section 05 5000 "Metal Fabrications" for steel framing at jamb openings.
- D. Section 08 7111 "Door Hardware" Cylinders for keyed control stations, roll down door cylinders, and keys provided by, and installed under this section.
- E. Division 26 "Electrical" for electrical connections and control wiring.

1.4 SYSTEM REQUIREMENTS

- A. Design Requirements: Contractor is responsible to coordinate with manufacturer of existing units for designing anchorage to structural system and necessary modifications to meet specified requirements and maintain visual design concepts.
- B. Interface with Adjacent Systems:
 - 1. Integrate design and connections with adjacent construction.
 - 2. Accommodate allowable tolerances and deflections for structural members in installation.

- C. Operation Cycles: Provide overhead coiling door components and operators capable of operating for not less than number of cycles indicated for each door. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.

1.5 SUBMITTALS

- A. General: Submit in accordance with Section 01 3219.
- B. Product Data: For each type and size of overhead coiling door and accessory. Include the following:
 - 1. Construction details, material descriptions, dimensions of individual components, profiles for slats, and finishes.
 - 2. Rated capacities, operating characteristics, electrical characteristics, and furnished accessories.
- C. LEED Submittal: See Section 018113 LEED Certification Requirements for the following:
 - 1. MRc4 Recycled Content: Product data for products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content.
 - a. Include cost information for each product having recycled content.
 - 2. MRc5 Regional Materials:
 - a. Sourcing location(s): indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery from the project site.
 - b. Manufacturing location(s): indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
 - c. Product Value: indicate dollar value of product containing regional materials; include materials costs only.
 - d. Product Component(s) Value: Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.
- D. For fire-rated doors, description of fire-release system including testing and resetting instructions.
- E. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 2. Show locations of replaceable fusible links.
 - 3. Wiring Diagrams: For power, signal, and control wiring.
- F. Submit following Informational Submittals:
 - 1. Support reactions design data.
 - 2. Certifications specified in Quality Assurance article.

OVERHEAD COILING DOORS

3. Manufacturer's instructions.

G. Closeout Submittals:

1. Submit under provisions of Section 01 7700.
2. Operation and maintenance data.

1.6 QUALITY ASSURANCE

- A. All rolling counter doors shall be designed to a standard maximum of 10 cycles per day and an overall maximum of 20,000 operating cycles for the life of the door
- B. Fire Rated Assemblies:
1. Provide assemblies which comply with NFPA 80 and have been tested, rated and labeled in accordance with ASTM E152, NFPA 252 or UL 10B.
 2. Identify each assembly with factory applied label indicating applicable fire rating.
- C. Certifications:
1. Submit certificates verifying AWS qualifications for each welder employed on Project.
 2. Submit manufacturer's certification that products furnished for Project meet or exceed specified requirements.
- D. STC Requirements: See Door Schedule Sheet in Drawings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturer: Subject to compliance with requirements, provide products by one of the following:
1. Cookson Company, The.
 2. Cornell Iron Works Inc.
 3. Overhead Door Corporation
 4. Pacific Rolling Door Co.
 5. Wayne Dalton Corporation
- B. (Note: Products specified herein are manufactured by the Cornell Iron Works, Inc. to establish appearance, performance and quality required for this project.)

2.2 MATERIALS

- A. Sheet Steel: Hot-dipped galvanized steel complying with ASTM A653, G90 zinc coating.
- B. Steel Shapes and Plates: ASTM A36.
- C. Gray Iron Castings: ASTM A48, Class 30B.

2.3 DOOR CURTAIN MATERIALS AND CONSTRUCTION

- A. Door Curtains: Fabricate overhead coiling-door curtain of interlocking metal slats, designed to withstand wind loading indicated, in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated, and as follows:
 - 1. Steel Door Curtain Slats: Zinc-coated (galvanized), cold-rolled structural steel sheet; complying with ASTM A 653/A 653M, with G90 (Z275) zinc coating; nominal sheet thickness (coated) of 0.028 inch (0.71 mm) and as required to meet requirements.
 - 2. Aluminum Door Curtain Slats: ASTM B 209 (ASTM B 209M) sheet or ASTM B 221 (ASTM B 221M) extrusions, alloy and temper standard with manufacturer for type of use and finish indicated; thickness of 0.050 inch (1.27 mm) and as required to meet requirements.
- B. Endlocks and Windlocks for Service Doors: Malleable-iron casings galvanized after fabrication, secured to curtain slats with galvanized rivets or high-strength nylon. Provide locks on not less than alternate curtain slats for curtain alignment and resistance against lateral movement.
- C. Endlocks for Counter Doors: Manufacturer's standard locks on not less than alternate curtain slats for curtain alignment and resistance against lateral movement.
- D. Bottom Bar for Service Doors: Consisting of two angles, each not less than 1-1/2 by 1-1/2 by 1/8 inch (38 by 38 by 3 mm) thick; fabricated from manufacturer's standard hot-dip galvanized steel, stainless steel, or aluminum extrusions to match curtain slats and finish.
- E. Bottom Bar for Counter Doors: Manufacturer's standard continuous channel or tubular shape, fabricated from manufacturer's standard hot-dip galvanized steel, stainless steel, or aluminum extrusions to match curtain slats and finish.
- F. Astragal for Interior Doors: Equip each door bottom bar with a replaceable, adjustable, continuous, compressible gasket of flexible vinyl, rubber, or neoprene as a cushion bumper.
- G. Curtain Jamb Guides: Manufacturer's standard angles or channels and angles of same material and finish as curtain slats unless otherwise indicated, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain, and a continuous bar for holding windlocks.

2.4 HOOD

- A. General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that projects beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging.
 - 1. Galvanized Steel: Nominal 0.028-inch- (0.71-mm-) thick, hot-dip galvanized steel sheet with G90 (Z275) zinc coating, complying with ASTM A 653/A 653M.
 - 2. Aluminum: 0.040-inch- (1.02-mm-) thick aluminum sheet complying with ASTM B 209 (ASTM B 209M), of alloy and temper recommended by manufacturer and finisher for type of use and finish indicated.

3. Include automatic drop baffle on fire-rated doors to guard against passage of smoke or flame.
4. Exterior-Mounted Doors: Fabricate hood to act as weather protection and with a perimeter sealant-joint-bead profile for applying joint sealant.

2.5 COUNTER DOORS

- A. Integral Frame, Hood, and Fascia for Counter Door: Welded sheet metal assembly of the following sheet metal:
 1. Galvanized Steel: Nominal 0.064-inch- (1.63-mm-) thick, hot-dip galvanized steel sheet with G90 (Z275) zinc coating, complying with ASTM A 653/A 653M.
- B. Fire-Rated, Laminate Counter: Fire-door manufacturer's high-pressure decorative laminate-covered countertop, UL or ITS tested and labeled for 1-1/2-hour fire rating for approved use with fire-door assembly.

2.6 CURTAIN ACCESSORIES

- A. Smoke Seals: Equip each fire-rated door with smoke-seal perimeter gaskets for smoke and draft control as required for door listing and labeling by a qualified testing agency.
- B. Weatherseals: Equip each exterior door with weather-stripping gaskets fitted to entire perimeter of door for a weathertight installation, unless otherwise indicated.
 1. At door head, use 1/8-inch- (3-mm-) thick, replaceable, continuous sheet secured to inside of hood.
 2. At door jambs, use replaceable, adjustable, continuous, flexible, 1/8-inch- (3-mm-) thick seals of flexible vinyl, rubber, or neoprene.
- C. Push/Pull Handles: Equip each push-up-operated or emergency-operated door with lifting handles on each side of door, finished to match door.
 1. Provide pull-down straps or pole hooks for doors more than 84 inches (2130 mm) high.
- D. Automatic Closing for Fire Rated Assemblies:
 1. Fabricate assemblies to permit manual lifting of curtain for emergency exit after automatic closing, with curtain returning to closed position when released.
 2. Provide automatic closing device and adjustable speed governor that becomes operative upon melting of 160 degrees F fusible link.
 3. In addition, equip assemblies with electro-mechanical time delay release device activated by building fire alarm system. Provide time delay release device with following characteristics:
 - a. UL listed for use with fire alarm system.
 - b. Activate automatic closing.
 - c. Equipped with time delay release action to prevent false drops due to momentary power outages or fire alarm test.
 - d. Time delay feature adjustable up to one minute.
 - e. Automatic resetting without need for factory authorized dealer involvement.
 4. Acceptable Product: SureFire, Cookson, or equivalent.

2.7 COUNTERBALANCING MECHANISM

- A. General: Counterbalance doors by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.
- B. Counterbalance Barrel: Fabricate spring barrel of manufacturer's standard hot-formed, structural-quality, welded or seamless carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of slats and to limit barrel deflection to not more than **0.03 in./ft. (2.5 mm/m)** of span under full load.
- C. Spring Balance: One or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Secure ends of springs to barrel and shaft with cast-steel barrel plugs.
- D. Torsion Rod for Counterbalance Shaft: Fabricate of manufacturer's standard cold-rolled steel, sized to hold fixed spring ends and carry torsional load.
- E. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

2.8 ELECTRIC DOOR OPERATORS

- A. General: Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and operation-cycles requirement specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, remote-control stations, control devices, integral gearing for locking door, and accessories required for proper operation.
 - 1. Comply with NFPA 70.
 - 2. Provide control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24 V, ac or dc.
- B. Usage Classification: Electric operator and components capable of operating for not less than number of cycles per hour indicated for each door.
- C. Door Operator Location(s): Operator location indicated for each door.
 - 1. Front-of-Hood Mounted: Operator is mounted to the right or left door head plate with the operator on coil side of the door-hood assembly and connected to the door drive shaft with drive chain and sprockets. Front clearance is required for this type of mounting.
- D. Electric Motors: Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements specified in Division 11 Section "Common Motor Requirements for Equipment" unless otherwise indicated.
 - 1. Electrical Characteristics:
 - a. Phase: Single phase.
 - b. Volts: 120 V.
 - c. Hertz: 60.
 - 2. Motor Type and Controller: Reversible motor and controller (disconnect switch) for motor exposure indicated.

OVERHEAD COILING DOORS

3. Motor Size: Minimum size as indicated. If not indicated, large enough to start, accelerate, and operate door in either direction from any position, at a speed not less than 8 in./sec. (203 mm/s) and not more than 12 in./sec. (305 mm/s), without exceeding nameplate ratings or service factor.
 4. Operating Controls, Controllers (Disconnect Switches), Wiring Devices, and Wiring: Manufacturer's standard unless otherwise indicated.
 5. Coordinate wiring requirements and electrical characteristics of motors and other electrical devices with building electrical system and each location where installed.
- E. Limit Switches: Equip each motorized door with adjustable switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.
- F. Obstruction Detection Device: Equip motorized door with indicated external automatic safety sensor capable of protecting full width of door opening. For non-fire-rated doors, activation of device immediately stops and reverses downward door travel. For fire-rated doors, activation delays closing.
1. Photoelectric Sensor: Manufacturer's standard system designed to detect an obstruction in door opening without contact between door and obstruction.
 - a. feature is activated, door closes only with sustained pressure on close button.
 2. Sensor Edge: Automatic safety sensor edge, located within astragal or weather stripping mounted to bottom bar. Contact with sensor activates device. Connect to control circuit using manufacturer's standard take-up reel or self-coiling cable.
- G. Remote-Control Station: Momentary-contact, three-button control station with push-button controls labeled "Open," "Close," and "Stop."
1. Interior units, full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.
 2. Exterior units, full-guarded, standard-duty, surface-mounted, weatherproof type, NEMA ICS 6, Type 4 enclosure, key operated.
- H. Emergency Manual Operation: Equip each electrically powered door with capability for emergency manual operation. Design manual mechanism so required force for door operation does not exceed **25 lbf (111 N)**.
- I. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.
- J. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.

2.9 COUNTER DOOR ASSEMBLY

- A. Counter Door: Overhead coiling door formed with curtain of interlocking metal slats.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Model ESC10 manufactured by Cornell Iron Works, Inc.
- B. Operation Cycles: Not less than 20,000.

- C. Door Curtain Slats: No. 1F, interlocked flat-faced slats, 1-1/2-inch (38-mm) high by 1/2 inch (13 mm) deep, 0.040 inch aluminum, with extruded tubular aluminum bottom bar with continuous lift handle and vinyl astragal.
- D. Curtain Jamb Guides: Aluminum with exposed finish matching curtain slats. Provide continuous integral wear strips to prevent metal-to-metal contact and to minimize operational noise.
- E. Fabricate interlocking slat sections with high strength molded nylon endlocks riveted to ends of alternate slats.
- F. Hood: Match curtain material and finish and shall be formed to fit the square brackets.
 - 1. Mounting: Face of wall.
- G. Sill Configuration for Counter Door: Integral metal sill.
- H. Electric Door Operator:
 - 1. Usage Classification: Medium duty, up to 15 cycles per hour.
 - 2. Operator Location: As shown on Drawings.
 - 3. Motor Exposure: Interior.
 - 4. Emergency Manual Operation: Push-up type.
 - 5. Obstruction-Detection Device: Automatic electric sensor edge on bottom bar.
 - 6. Remote-Control Station: Where shown on Drawings.
- I. Door Finish:
 - 1. Aluminum Finish: Anodized color as selected by Architect from full range of industry colors and color densities.

2.10 FIRE-RATED COUNTER DOOR ASSEMBLY

- A. Fire-Rated Counter Door: Overhead fire-rated coiling door formed with curtain of interlocking metal slats.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Model ERC10 manufactured by Cornell Iron Works, Inc.
- B. Operation Cycles: Not less than 20,000.
- C. Fire Rating: As indicated on Drawings.
- D. Door Curtain Material: Galvanized steel.
- E. Door Curtain Slats: No. 1F, interlocked flat-faced slats, 1-1/2 inches (38 mm) high by 1/2 inch (13 mm) deep, 22 gauge ASTM A653, Commercial Quality, galvanized steel with plain steel bottom bar and vinyl astragal.
- F. Fabricate continuous interlocking slat sections with high strength galvanized steel endlocks riveted to slats per UL requirements.
- G. Curtain Jamb Guides: Galvanized steel, 12 gauge with exposed finish matching curtain slats.

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- H. Integral Frame, Hood, and Fascia for Counter Door: Galvanized steel.
 - 1. Mounting: As shown on Drawings.
- I. Sill Configuration for Fire-Rated Counter Door: Fire-rated, laminate counter.
 - 1. High-Pressure Decorative Laminate: Match color, pattern, and finish as selected by Architect from manufacturer's full range.
- J. Electric Door Operator:
 - 1. Usage Classification: Medium duty, up to 15 cycles per hour.
 - 2. Operator Location: As shown on Drawings.
 - 3. Motor Exposure: Interior.
 - 4. Obstruction Detection Device: Automatic electric sensor edge on bottom bar.
 - 5. Remote-Control Station: Where shown on Drawings.
- K. Door Finish:
 - 1. Baked-Enamel or Powder-Coated Finish: Color as selected by Architect from manufacturer's full range.

2.11 SERVICE DOOR ASSEMBLY

- A. Service Door: Overhead coiling door formed with curtain of interlocking metal slats.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Model ESD10 manufactured by Cornell Iron Works, Inc.
- B. Operation Cycles: Not less than 50,000.
 - 1. Include tamperproof cycle counter.
- C. Door Curtain Slats: Flat profile slats of 2-5/8-inch (67-mm) center-to-center height.
- D. Curtain Jamb Guides: Aluminum with exposed finish matching curtain slats. Provide continuous integral wear strips to prevent metal-to-metal contact and to minimize operational noise.
- E. Hood: Aluminum.
 - 1. Shape: As shown on Drawings.
 - 2. Mounting: As shown on Drawings.
- F. Electric Door Operator: Model MG, manufactured by Cornell Iron Works, Inc.
 - 1. Usage Classification: Industrial duty, up to 20 cycles per hour.
 - 2. Operator Location: As shown on Drawings.
 - 3. Motor Exposure: Exterior, wet, and humid.
 - 4. Emergency Manual Operation: Chain type.
 - 5. Obstruction-Detection Device: Automatic electric sensor edge on bottom bar; self-monitoring type.
 - a. Sensor Edge Bulb Color: As selected by Architect from manufacturer's full range.
 - 6. Remote-Control Station: Where shown on Drawings.

- G. Door Finish:
 - 1. Baked-Enamel or Powder-Coated Finish: Color: RAL 9003.

2.12 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.

2.13 ALUMINUM FINISHES

- A. Baked-Enamel or Powder-Coat Finish: AAMA 2603. Comply with coating manufacturer's written instructions for cleaning, conversion coating, application, and baking.

2.14 STEEL AND GALVANIZED-STEEL FINISHES

- A. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Carefully examine all units to be relocated prior to removal. Replace all parts recommended by the original manufacture.
- B. Examine conditions and proceed with Work when new substrates are ready.
- C. Verify that openings are prepared with headers level, jams plumb, floor level, without projections, and correctly dimensioned to receive assemblies.

3.2 INSTALLATION

- A. Install assemblies and operating equipment complete with operators, and related accessories in accordance with Section 01 3219 and approved shop drawings.
- B. Install fire rated assemblies to comply with NFPA 80.
- C. Coordinate installation with electrical service and fire alarm system.
- D. Upon completion of installation, including work by other trades, test and adjust curtains to operate easily, free from warp, twist or distortion.

OVERHEAD COILING DOORS

- E. Test automatic closing feature of fire rated assemblies. Adjust closing speed to comply with NFPA and Owner requirements.
- F. Clean surfaces, joints and bearings of unit in accordance with manufacturer's instructions; lubricate as recommended by manufacturer.

3.3 ADJUSTING

- A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.
- B. Lubricate bearings and sliding parts as recommended by manufacturer.
- C. Adjust seals to provide weathertight fit around entire perimeter.

3.4 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain overhead coiling doors.

3.5 SCHEDULE

- A. Refer to Door Schedule for type, location, sizes, materials and finish.

- END OF SECTION -

- SECTION 08 4113 -

**ALUMINUM FRAMED ENTRANCES &
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. This Section describes the requirements for furnishing and installing aluminum framed storefronts, including exterior entrance doors, transoms, sidelights, and storefront-type framing system for the following:
 - 1. Exterior storefront framing.
 - 2. Storefront framing for window walls.
 - 3. Exterior manual-swing entrance doors and door-frame units.

1.3 RELATED SECTIONS

- A. Section 01 74 19 "Materials Recycling & Waste Management".
- B. Section 01 81 13 "LEED Certification Requirements".
- C. Section 07 4215 "Glass Facade Panel System" for glass wall panel system at vertical wall surfaces and sloped soffit conditions.
- D. Section 07 4219 "Metal Plate Wall Panels" for metal plate wall panels at vertical wall surfaces.
- E. Section 08 7111 "Door hardware" for hardware not specified to be included with storefront manufacturer.
- F. Section 08 8000 "Glazing" for interior and exterior glazing.

1.4 SYSTEM PERFORMANCE REQUIREMENTS

- A. General: Provide aluminum entrances and storefront assemblies that comply with performance characteristics specified, as demonstrated by testing the manufacturer's corresponding stock assemblies according to specified test methods.

- B. Thermal Movement: Design the aluminum entrance and storefront framing systems to provide for expansion and contraction of the component materials resulting from a surface temperature range of 180-deg. F. without buckling, failure of joint seals, undue stress on structural elements, damaging loads on fasteners, reduction of performance, stress on glass, or other detrimental effects. Entrance doors shall function normally over the specified temperature range.
- C. Wind Loads: Provide aluminum entrance and storefront framing system, including anchorage, capable of withstanding wind-load design pressures calculated according to the requirements of CBC Chapter 16, Division II.
- D. Structural Performance: Conduct tests for structural performance in accordance with ASTM E330. At the conclusion of the tests there shall be no glass breakage or permanent damage to fasteners, anchors, hardware or actuating mechanism. Framing members shall have no permanent deformation in excess of 0.2-percent of their clear span.
 - 1. Deflection Normal to Plane of the Wall: Test pressure required to measure deflection of framing members normal to the plane of the wall shall be equivalent to the specified wind load. Deflection shall not exceed 1/175 of the clear span, when subjected to uniform load deflection test.
 - 2. Deflection Parallel to the Plane of the Wall: Test pressures required to measure deflection parallel to the plane of the wall shall be equal to 1.5 times the specified wind pressure. Deflection of any member carrying its full dead load shall not exceed an amount that will reduce glass bite below 75-percent of the design dimension and shall not reduce the edge clearance between the member and the fixed panel, glass or other fixed member above to less than 1/8-inch. The clearance between the member and an operable door or window shall be at least 1/16-inch.
- E. Air Infiltration: Provide aluminum entrance and storefront framing system with an air infiltration rate of not more than 0.06-cfm per sq. ft. of fixed area, excluding operable door edges, when tested in accordance with ASTM E283 at an inward test pressure differential of 1.57-psf.
- F. Water Penetration: Provide framing systems with no uncontrolled water penetration, excluding operable door edges, as defined in the test method when tested in accordance with ASTM E331 and E547 at an inward test pressure differential of 6.24-psf. Water penetration must include compensation channels, if used.

1.5 SUBMITTALS

- A. Product Data: Furnish product data for each system showing manufacturer's standard details and fabrication methods, data on finishing, and accessories, and recommendations for maintenance and cleaning.
- B. LEED Submittal: See Section 018113 LEED Certification Requirements for the following:
 - 1. Product Data for Credit EQ 4.1: For adhesives and sealants used inside of the weatherproofing system, including printed statement of VOC content.
 - 2. MRc4 Recycled Content: Product data for products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content.
 - a. Include cost information for each product having recycled content.

3. MRc5 Regional Materials:
 - a. Sourcing location(s): indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery from the project site.
 - b. Manufacturing location(s): indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
 - c. Product Value: indicate dollar value of product containing regional materials; include materials costs only.
 - d. Product Component(s) Value: Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.
- C. Shop Drawings: Furnish shop drawings for each system showing layout and installation details, including relationship to adjacent work, elevations at 1/4-inch scale, detail sections of typical composite members, anchors and reinforcement, hardware mounting heights, provisions for expansion and contraction, and glazing details.
- D. Samples for Verification: Furnish samples of each type and color of aluminum finish selected, on 12-inch long sections of extrusions or formed shapes and 6-inch square sheets.
- E. Test Reports: Furnish certified test reports from a qualified independent testing laboratory showing that aluminum entrance and storefront framing systems have been tested in accordance with specified test procedures and comply with specified performance characteristics.

1.6 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: A minimum of 5-years experience in the manufacture of aluminum entrances and storefronts of the types specified.
- B. Installer's Qualifications: Minimum 5-years experience in the installation of systems similar to those required.
- C. Quality-Control Program for Structural-Sealant-Glazed System: Develop quality control program specifically for Project. Document quality-control procedures and verify results for aluminum-framed systems. Comply with ASTM C 1401 recommendations including, but not limited to, system material-qualification procedures, preconstruction sealant-testing program, procedures for system fabrication and installation, and intervals of reviews and checks.
- D. Product Options: Information on Drawings and in Specifications establishes requirements for systems' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.
 1. Do not revise intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If revisions are proposed, submit comprehensive explanatory data to Architect for review.
- E. Accessible Entrances: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines.

- F. Source Limitations for Aluminum-Framed Systems: Obtain from single source from single manufacturer.
- G. Welding Qualifications: Qualify procedures and personnel according to AWS D1.2, "Structural Welding Code - Aluminum."
- H. Preinstallation Conference: Conduct conference at Project site.
- I. Manufacturers installation procedures and shop drawings must be kept on-site throughout the construction of the projects

1.7 MOCK-UPS

- A. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
 - 1. Build mockup of typical wall, minimum area of 75 sq ft. (6.97 sq. m)
 - 2. Field testing shall be performed on mockups according to requirements in "Field Quality Control" Article.
 - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver aluminum entrance and storefront components in the manufacturer's original protective packaging.
- B. Store aluminum components in a clean, dry location away from uncured stucco, masonry or concrete. Cover components with waterproof paper, tarpaulin or polyethylene sheeting in a manner to permit circulation of air.
 - 1. Stack framing components in a manner that will prevent bending and avoid significant or permanent damage.

1.9 PROJECT CONDITIONS

- A. Field Measurements: Check openings by accurate field measurement before fabrication. Show recorded measurements on shop drawings. Coordinate fabrication with construction progress to avoid delay of the work.
 - 1. When necessary, proceed with fabrication without field measurements, and coordinate fabrication tolerances to ensure proper fit.

1.10 WARRANTY

- A. Furnish written warranty covering aluminum entrances and storefronts that fail in materials or workmanship within 3-years from date of Substantial Completion. Failures include, but are not limited to structural failures including excessive deflection, excessive leakage or air infiltration, faulty operation, and deterioration of metals, metal finishes, and other materials beyond normal weathering.

ALUMINUM FRAMED ENTRANCES & STOREFRONTS

1. Warranty shall cover all components installed as part of the framed entrances and storefronts.
- B. This warranty shall be in addition to and not a limitation of other rights the Owner may have against the Contractor under the Contract Documents.
- C. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes do not comply with requirements or that fail in materials or workmanship within specified warranty period. Warranty does not include normal weathering.
 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURER

1. Basis-of-Design Product: The design for offset glazed aluminum-framed systems is based on "Series OS451" and "Series OS601" manufacturer by United States Aluminum, Waxahachie, TX. Tel: (800) 627-6440 or (972) 937-9651, web: www.usalum.com,
- B. Entrance Doors:
 1. Basis of Design: Entrance Doors: Model "550 Wide Stile", heavy duty as manufactured by United States Aluminum, or subject to compliance with requirements, provide a comparable product by one of the manufactures above.

2.2 MATERIALS

- A. Aluminum Members: 6063-T5 alloy and temper.
- B. Fasteners: Aluminum or Series 300 nonmagnetic stainless steel.
 1. Do not use exposed fasteners except for application of hardware. For application of hardware, use Phillips flat-head machine screws that match the finish of member or hardware item being fastened.
- C. Concealed Flashing: Dead-soft stainless steel or extruded aluminum as selected by manufacturer for compatibility with other components.
- D. Brackets and Reinforcements: Aluminum or nonmagnetic stainless steel. Provide non-staining, non-ferrous shims for installation and alignment as required.
- E. Weatherstripping: Manufacturer's standard replaceable type. Provide weatherstripping on meeting stiles of pairs of doors and at bottom rail of each door leaf.

2.3 COMPONENTS

- A. Storefront Framing Systems: Provide storefront, entrance framing systems, and sunscreens fabricated from extruded aluminum members of size and profile indicated. Include subframes and other reinforcing members as required. Provide for flush glazing storefront from the exterior on all sides without projecting stops. Shop-fabricate and pre-assemble frame components where possible. Provide storefront frame sections without exposed seams.

1. Mullion Configuration: Provide pockets at the inside glazing face to receive resilient elastomeric glazing. Mullions and horizontals shall be one piece. Make provisions to drain moisture accumulation to the exterior.
- B. Stile-and-Rail Type Entrance Doors: Door corner construction shall consist of mechanical clip fastening, SIGMA deep penetration and fillet welds.
 1. Glazing: Fabricate doors to facilitate replacement of glass or aluminum panels, without disassembly of stiles and rails. Provide snap-on extruded aluminum glazing stops, with exterior stops anchored for non-removal.
 2. Design: 1-3/4-inch thick, stile and rail dimensions as indicated.
 3. Each door leaf shall be equipped with an adjusting mechanism located in the top rail near the lock stile, which provides for minor clearance adjustments after installation.

2.4 ENTRANCE DOOR SYSTEMS

- A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.
 1. Door Construction: 1-3/4-inch (44.5-mm) overall thickness, with minimum 0.125-inch (3.2-mm-) thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.
 - a. Thermal Construction: High-performance plastic connectors separate aluminum members exposed to the exterior from members exposed to the interior.
 2. Door Design: Wide stile; 5-inch (127-mm) nominal width.
 - a. Accessible Doors: Smooth surfaced for width of door in area within 10 inches (255 mm) above floor or ground plane.
 3. Glazing Stops and Gaskets: Beveled, snap-on, extruded-aluminum stops and preformed gaskets.
 - a. Provide nonremovable glazing stops on outside of door.
- B. Entrance Door Hardware: As specified in Division 8 Section "Door Hardware."

2.5 ACCESSORY MATERIALS

- A. Joint Sealants: For installation at perimeter of aluminum-framed systems, per manufacturer's requirements.
 1. Provide sealants for use inside of the weatherproofing system that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos; formulated for 30-mil (0.762-mm) thickness per coat.

2.6 FABRICATION

- A. General: Fabricate aluminum entrance and storefront components to designs, sizes and thickness indicated, and to comply with specified standards. Sizes and profile requirements are indicated on the drawings.

- B. Prefabrication: Complete fabrication, assembly, finishing, hardware application, and other work before shipment to Project site. Disassemble components only where necessary for shipment and installation.
1. Perform fabrication operations, including cutting, fitting, forming, drilling and grinding of metal work to prevent damage to exposed finish surfaces. Complete these operations for hardware prior to application of finishes.
 2. Do not drill and tap for surface-mounted hardware items until time of installation at Project site.
- C. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:
1. Profiles that are sharp, straight, and free of defects or deformations.
 2. Accurately fitted joints with ends coped or mitered.
 3. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.
 4. Physical and thermal isolation of glazing from framing members.
 5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
 6. Provisions for field replacement of glazing interior for vision glass and exterior for spandrel glazing or metal panels.
 7. 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.
 2. At interior doors, provide silencers at stops to prevent metal-to-metal contact. Install three silencers on strike jamb of single-door frames and two silencers on head of frames for pairs of doors.
- 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. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.
- G. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.
- H. Welding: Comply with AWS recommendations. Grind exposed welds smooth to remove weld spatter and welding oxides. Restore mechanical finish.
1. Welding behind finished surfaces shall be performed to minimize distortion and discoloration on the finished surface.
- I. Reinforcing: Install reinforcing as required for hardware, performance requirements, sag resistance and rigidity.

- J. Dissimilar Metals: Separate dissimilar metals with bituminous paint, suitable sealant, elastomeric tape, or gasket between the surfaces. Do not use coatings containing lead.
- K. Continuity: Maintain accurate relation of planes and angles with hairline fit of contacting members.
- L. Conceal fasteners wherever possible.
- M. Weatherstripping: For exterior doors, provide compression weatherstripping against fixed stops. At other edges, provide sliding weatherstripping retained in adjustable strip mortised into door edge.

2.7 ALUMINUM FINISHES

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. High-Performance Organic Finish: 2-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 1. Color and Gloss: Alabaster White.

2.8 SOURCE QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to evaluate structural-sealant-glazed systems.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with manufacturer's instructions and recommendations for installation.
- B. Set units plumb, level, and true to line, without warp or rack of framing members, doors, or panels. Install components in proper alignment and relation to established lines. Provide proper support and anchor securely in place
- C. Installation Tolerances:
 - 1. Variation from Plane: Do not exceed 1/8-inch in 12-feet of length or 1/4-inch in any total length.
 - 2. Offset from Alignment: The maximum offset from true alignment between two identical members abutting end-to-end in line shall not exceed 1/16-inch.
 - 3. Diagonal Measurements: The maximum difference in diagonal measurements shall not exceed 1/8-inch.
 - 4. Offset at Corners: The maximum out-of-plane offset of framing at corners shall not exceed 1/32-inch.

- D. Separate aluminum and other corrodible metal surfaces from sources of corrosion or electrolytic action at points of contact with other materials.
 - 1. Paint dissimilar metals where drainage from them passes over aluminum.
 - 2. Paint aluminum surfaces in contact with mortar, concrete or other masonry with alkali-resistant coating.
 - 3. Paint wood and similar absorptive material in contact with aluminum and exposed to the elements or otherwise subjected to wetting, with 2-coats of aluminum house paint. Seal joints between the materials with sealant.
- E. Drill and tap frames and doors and apply surface-mounted hardware in compliance with hardware manufacturer's instructions and template requirements. Use concealed fasteners wherever possible.
- F. Set sill members and other members in bed of sealant, or use joint fillers or gaskets to provide weathertight construction. Comply with requirements of Section 07 9200.
- G. Where flashings are indicated adjacent to work specified in this Section, provide flashings in 0.040-inch aluminum, finished to match entrances and storefronts.

3.2 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Testing Services: Testing and inspecting of representative areas to determine compliance of installed systems with specified requirements shall take place as follows and in successive stages as indicated on Drawings. Do not proceed with installation of the next area until test results for previously completed areas show compliance with requirements.
 - 1. Air Infiltration: Areas shall be tested for air leakage of 1.5 times the rate specified for laboratory testing under "Performance Requirements" Article, but not more than **0.09 cfm/sq. ft. (0.03 L/s per sq. m)**, of fixed wall area when tested according to ASTM E 783 at a minimum static-air-pressure difference of **1.57 lbf/sq. ft. (75 Pa)**.
 - 2. Water Penetration: Areas shall be tested according to ASTM E 1105 at a minimum uniform and cyclic static-air-pressure difference of 0.67 times the static-air-pressure difference specified for laboratory testing under "Performance Requirements" Article, but not less than **4.18 lbf/sq. ft. (200 Pa)**, and shall not evidence water penetration.
 - a. The mock-up infiltration test according to AAMA 502 (ASTM E1105), Method B, with sill dam tests.
 - 3. Water Spray Test: Before installation of interior finishes has begun, a minimum area of **75 feet (23 m)** by 1 story of aluminum-framed systems designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.
- C. Repair or remove work where test results and inspections indicate that it does not comply with specified requirements.
- D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.3 ADJUSTING

- A. Entrances: Adjust operating hardware for smooth operation according to hardware manufacturers' written instructions, providing smooth operation without binding, and to prevent tight fit at contact points and weatherstripping.
 - 1. For doors accessible to people with disabilities, adjust closers to provide a 3-second closer sweep period for doors to move from a 70-degree open position to 3 inches (75 mm) from the latch measured to the leading door edge.

3.4 CLEANING

- A. Clean the completed system, inside and out, promptly after installation, exercising care to avoid damage to coatings.
- B. Clean glass surfaces after installation, complying with the requirements specified in Section 08800. Remove excess glazing and sealant compounds, dirt and other substances from aluminum surfaces.

3.5 PROTECTION

- A. Institute protective measures required throughout the remainder of the construction period to ensure that aluminum entrances and storefronts will be without damage or deterioration, other than normal weathering, at time of acceptance

- END OF SECTION -

- SECTION 08 4413 -

GLAZED ALUMINUM CURTAIN WALLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes
 - 1. Conventionally glazed aluminum curtain walls installed as stick framed systems, including perimeter trims, stools, accessories, shims and anchors, and perimeter sealing of curtain wall framing.

1.3 RELATED SECTIONS

- A. Section 01 74 19 "Materials Recycling & Waste Management".
- B. Section 01 81 13 "LEED Certification Requirements".
- C. Section 07 9200 "Joint Sealants" for installation of joint sealants installed with glazed aluminum curtain-wall systems and for sealants to the extent not specified in this Section.
- D. Section 08 4113 "Aluminum Framed Entrances and Storefronts" for entrance doors, storefront systems and windows installed with glazed aluminum curtain-wall systems.
- E. Section 08 8000 "Glazing" for insulating-glass requirements.

1.4 SYSTEM DESCRIPTION

- A. General: In addition to requirements shown or specified, comply with:
 - 1. Applicable provisions of AAMA Metal Curtain Wall Manual for design, materials, fabrication and installation of component parts.

1.5 PERFORMANCE REQUIREMENTS

- A. General: Provide glazed aluminum curtain-wall systems, including anchorage, capable of withstanding, without failure, the effects of the following:
 - 1. Structural loads.

2. Thermal movements.
 3. Movements of supporting structure indicated on Drawings including, but not limited to, story drift, twist, column shortening, long-term creep and deflection from uniformly distributed and concentrated live loads.
 4. Dimensional tolerances of building frame and other adjacent construction.
 5. Failure includes the following:
 - a. Deflection exceeding specified limits.
 - b. Thermal stresses transferred to building structure.
 - c. Framing members transferring stresses, including those caused by thermal and structural movements, to glazing.
 - d. Noise or vibration created by wind and thermal and structural movements.
 - e. Loosening or weakening of fasteners, attachments, and other components.
 - f. Sealant failure.
- B. Structural Loads:
1. Wind & Seismic Loads: As indicated on drawings
 2. Metal Louver Loads: As indicated on drawings
- C. Structural-Test Performance: Provide glazed aluminum curtain-wall systems tested according to ASTM E 330 as follows:
1. When tested at positive and negative wind-load design pressures, systems do not evidence deflection exceeding specified limits.
 2. When tested at 150-percent of positive and negative wind-load design pressures, systems, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2-percent of span.
 3. Test Duration: As required by design wind velocity but not less than 60-seconds.
- D. Deflection of Framing Members:
1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to **13-feet 6-inches**, and to 1/240 of clear span plus **1/4-inch**, for spans greater than **13-feet 6-inches** or an amount that restricts edge deflection of individual glazing lites to **3/4-inch**, whichever is less.
- E. Story Drift: Provide glazed aluminum curtain-wall systems that accommodate design displacement of adjacent stories indicated.
1. Design Displacement: As determined by manufactures engineer.
- F. Thermal Movements: Provide glazed aluminum curtain-wall systems that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): **120-degrees F**, ambient; **180-degrees F**, material surfaces.
- G. Air Infiltration: Provide glazed aluminum curtain-wall systems with maximum air leakage of **0.06-cfm/sq. ft.** of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure differential of **6.24-lbf/sq. ft.**

- H. Water Penetration Under Static Pressure: Provide aluminum glazed curtain-wall systems that do not evidence water penetration when tested according to ASTM E 331 at a minimum differential static pressure of 20-percent of positive design wind load, but not less than 10-lbf/sq. ft.
1. Maximum Water Leakage: No uncontrolled water penetrating systems or appearing on systems' normally exposed interior surfaces from sources other than condensation. Water controlled by flashing and gutters that is drained to exterior and cannot damage adjacent materials or finishes is not considered water leakage.
 2. Water Resistance, (dynamic): The test specimen shall be tested in accordance with AAMA 501.1. There shall be no leakage at an air pressure differential of 12-psf as defined in AAMA 501.
- I. Condensation Resistance: Provide glazed aluminum curtain-wall systems with condensation-resistance factor (CRF) of not less than 73 (frame) and 68 (glass) when tested according to AAMA 1503.
- J. Average Thermal Conductance: Provide glazed aluminum curtain-wall systems with average U-factor of not more than $0.66\text{-Btu/sq. ft.} \times \text{h} \times \text{deg F}$ when tested according to AAMA 1503.
- K. Sound Transmission: Provide glazed aluminum curtain-wall systems with minimum STC 32 according to ASTM E 413 and an OITC 26 according to ASTM E 1332, as determined by testing according to ASTM E 90.

1.6 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of product indicated.
- B. LEED Submittal:
1. Product Data for Credit EQ 4.1: For glazing sealants used inside of the weatherproofing system, including printed statement of VOC content.
- C. Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication and assembly of glazed aluminum curtain-wall systems.
1. Include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation, registered within the State of California.
- D. Samples for Initial Selection: For units with factory-applied color finishes.
- E. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.
- F. Fabrication Sample: Of each vertical-to-horizontal intersection of systems, made from 12-inch lengths of full-size components and showing details of the following:
1. Joinery.
 2. Anchorage.
 3. Expansion provisions.

- 4. Glazing.
- 5. Flashing and drainage.

- G. Welding certificates.
- H. Qualification Data: For Installer and testing agency.
- I. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for glazed aluminum curtain-wall systems.
- J. Preconstruction Testing Program: Developed specifically for project.
- K. Preconstruction Test Reports: For glazed aluminum curtain-wall systems.
- L. Field quality-control test reports.
- M. Warranties: Special warranties specified in this Section.

1.7 QUALITY ASSURANCE

- A. Single Source Responsibility:
 - 1. Obtain entrances, storefronts, ribbon walls, window walls, curtain walls, window systems, and finish through one source from a single manufacturer.

- B. Provide test reports from AAMA accredited laboratories certifying the performances as specified in Article 1.5.

- C. Installer Qualifications: Capable of assuming engineering responsibility and performing Work of this section and who is acceptable to manufacturer.
 - 1. Engineering Responsibility: Preparation of data and calculations for glazed aluminum curtain-wall systems, including the following:
 - a. Shop Drawings based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this project and submission of reports of tests performed on manufacturer's standard assemblies.

- D. Testing Agency Qualifications: An independent agency qualified according to ASTM E 699 for testing indicated.

- E. Product Options: Information on drawings and in Specifications establishes requirements for systems' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.
 - 1. Do not modify intended aesthetic effects, as judged solely by University's Representative, except with University's Representative approval. If modifications are proposed, submit comprehensive explanatory data to University's Representative for review.

- F. Preconstruction Testing Service: Engage a qualified independent testing agency to test glazed aluminum curtain-wall systems for compliance with specified requirements for performance and test methods. Provide test specimens and assemblies representative of proposed materials and construction.
1. Select sizes and configurations of assemblies to adequately demonstrate capability of glazed aluminum curtain-wall systems to comply with performance requirements and according to AAMA 501 recommendations.
- G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination". Review methods and procedures related to glazed aluminum curtain-wall systems including, but not limited to, the following:
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 required testing, inspecting, and certifying procedures.

1.8 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of structural supports for glazed aluminum curtain-wall systems by field measurements before fabrication and indicate measurements on Shop Drawings.
- B. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating glazed aluminum curtain-wall systems without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions

1.9 WARRANTY

- A. Special Assembly Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of glazed aluminum curtain-wall systems that do not comply with requirements or that deteriorate as defined in this section within specified warranty period.
1. Failures include, but are not limited to, the following:
 - a. Structural failures including, but not limited to, excessive deflection.
 - b. Noise or vibration caused by thermal movements.
 - c. Water leakage.
 - d. Failure of operating components to function normally.
 2. Warranty Period: Two-years from date of Substantial Completion.
- B. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes fail within specified warranty period. Warranty does not include normal weathering.
1. Warranty Period: 20-years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: The design for aluminum-framed systems is based on United States Aluminum "Front Glazed Series 3150, 2-1/2" x 7" pressure plate glazed system for 1/4", or 1" glass. Subject to compliance with requirements, provide the named product or a comparable product by one of the following
1. Kawneer North America; an Alcoa company.
 2. United States Aluminum.
 3. Vistawall Architectural Products; The Vistawall Group; a Bluescope Steel company.

2.2 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
1. Sheet and Plate: ASTM B 209 (ASTM B 209M).
 2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).
 3. Extruded Structural Pipe and Tubes: ASTM B 429.
 4. Structural Profiles: ASTM B 308/B 308M.
 5. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.
- B. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.
1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
 2. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
 3. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

2.3 FRAMING

- A. Framing Members: Manufacturer's standard extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
1. Construction: Thermally improved.
 2. Glazing System: Retained mechanically with gaskets on four sides.
 3. Glazing Plane: Front.
- B. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.
- C. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
 2. Reinforce members as required to receive fastener threads.

3. Use exposed fasteners, only where unavoidable, with countersunk Phillips screw heads, fabricated from 300 series stainless steel, finished to match framing system.
- D. Anchors: Three-way adjustable anchors with minimum adjustment of **1 inch (25.4 mm)** that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.
 1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123/A 123M or ASTM A 153/A 153M requirements.
- E. Concealed Flashing: Dead-soft, **0.018-inch- (0.457-mm-)** thick stainless steel, ASTM A 240/A 240M of type recommended by manufacturer.
- F. Framing Sealants: Manufacturer's standard sealants.

2.4 GLAZING SYSTEMS

- A. Glazing: As specified in Section 08 8000 "Glazing."
- B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.
 1. Compression-type design, replaceable, molded or extruded santoprene, polyvinyl chloride (PVC), or ethylene propylene diene monomer (EPDM).
- C. Glazing Sealants: As specified in Section 08 8000 "Glazing".

2.5 INSULATED SPANDREL PANELS

- A. Insulated Spandrel Panels: Laminated, metal-faced flat panels with no deviations in plane exceeding 0.8-percent of panel dimension in width or length.
 1. Overall Panel Thickness: **1-inch**.
 2. Exterior Skin: Aluminum.
 - a. Thickness: Minimum 0.032 aluminum face.
 - b. Finish: Matching framing system.
 - c. Texture: Smooth.
 - d. Backing Sheet: **0.157-inch** thick cement board.
 3. Interior Skin: Aluminum.
 - a. Backing Sheet: **0.157-inch** thick cement board.
 4. Thermal Insulation Core: Manufacturer's standard rigid, closed-cell, polyisocyanurate board.

2.6 ACCESSORY MATERIALS

- A. 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. Form aluminum shapes before finishing.

- B. Fabricate components that, when assembled, have the following characteristics:
 - 1. Sharp profiles, straight and free of defects or deformations.
 - 2. Accurately fitted joints with ends coped or mitered.
 - 3. Internal guttering systems or other means to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.
 - 4. Physical and thermal isolation of glazing from framing members.
 - 5. Accommodations for thermal and mechanical movements of glazing and framing to prevent glazing-to-glazing contact and to maintain required glazing edge clearances.
 - 6. Provisions for reglazing from exterior.
 - 7. Provisions shall be made at all sealed horizontals to keep moisture accumulation to the exterior.
 - 8. System shall provide for two-piece horizontal framing so that all fasteners at intersection of horizontal and vertical members will be concealed.
 - 9. There shall be no exposed fasteners at perimeter sections.
- C. After fabrication, clearly mark components to identify their locations in project according to shop drawings.

2.8 ALUMINUM FINISHES

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. High-Performance Organic Finish: Three-coat fluoropolymer finish complying with AAMA 2605 and 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.
 - 1. Color and Gloss: As selected by Architect from manufacturer's full range.
- C. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
 - 1. Coatings Manufacturers:
 - a. Valspar Corporation
 - b. PPG Industries, Inc.
 - c. BASF
- D. Exposed surfaces shall be free of scratches and other serious blemishes.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

- A. General:
1. Comply with manufacturer's written instructions.
 2. Do not install damaged components.
 3. Fit joints to produce hairline joints free of burrs and distortion.
 4. Rigidly secure non-movement joints.
 5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
 6. Seal joints watertight, unless otherwise indicated.
- B. Metal Protection:
1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape or installing nonconductive spacers as recommended by manufacturer for this purpose.
 2. Where aluminum will contact concrete, protect against corrosion by painting contact surfaces with bituminous paint.
- C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.
- D. Install components plumb and true in alignment with established lines and grades.
- E. Install operable units level and plumb, securely anchored, and without distortion. Adjust weather-stripping contact and hardware movement to produce proper operation.
- F. Install glazing as specified Section 08 8000 "Glazing".
- G. Install sealants as specified in Section 07 9200 "Joint Sealants".
- H. Erection Tolerances: Install glazed aluminum curtain-wall systems to comply with the following maximum tolerances:
1. Plumb: 1/8-inch in 10-feet, 1/4-inch in 40-feet.
 2. Level: 1/8-inch in 20-feet; 1/4-inch in 40-feet.
 3. Alignment:
 - a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2-inch wide, limit offset from true alignment to 1/16-inch.
 - b. Where surfaces are separated by reveal or protruding element from 1/2- to 1-inch wide, limit offset from true alignment to 1/8-inch.
 - c. Where surfaces are separated by reveal or protruding element of 1-inch wide or greater, limit offset from true alignment to 1/4-inch.
 4. Location: Limit variation from plane to 1/8-inch in 12-feet; 1/2-inch over total length.

3.3 FIELD QUALITY CONTROL

- A. Manufacturer's Field Services: Provide manufacturer's field service consisting of product use recommendations and periodic site visit for inspection of product installation in accordance with manufacturer's instructions.
 - 1. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
 - 2. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. Testing Agency: Engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- C. Field Tests: University's Representative shall select curtain wall 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.
 - 1. Testing: Testing shall be performed per AAMA 503 by a qualified independent testing agency. Refer to Division 1 Testing Section for payment.
 - 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/ft^2 , which ever is greater.
 - b. 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 10-psf.
- D. Repair or remove work where test results and inspections indicate that it does not comply with specified requirements.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

- END OF SECTION -

- SECTION 08 7111 -

FINISH HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes items known commercially as finish or door hardware that are required for swing, sliding, and folding doors, except special types of unique hardware specified in the same sections as the doors and door frames on which they are installed.
- B. This Section includes the following, but is not necessarily limited to:
 - 1. Door Hardware, including electric hardware.
 - 2. Storefront and Entrance door hardware.
 - 3. Hold-open closers with smoke detectors.
 - 4. Wall or floor-mounted electromagnetic hold-open devices.
 - 5. Power supplies for electric hardware.
 - 6. Low-energy door operators plus actuators.
 - 7. Thresholds, gasketing and weather-stripping.
 - 8. Door silencers or mutes.
- C. Related Sections: The following sections are noted as containing requirements that relate to this Section, but may not be limited to this listing.
 - 1. Division 8: Section - Steel Doors and Frames.
 - 2. Division 8: Section - Wood Doors. FRP Doors
 - 3. Division 8: Section - Aluminum Storefront
 - 4. Division 28: Section - Fire/Life-Safety Systems & Security Access Systems.

1.3 REFERENCES (USE DATE OF STANDARD IN EFFECT AS OF BID DATE.)

- A. ADAAG - Americans with Disabilities Act (ACT) Accessibility Guidelines for Buildings and Facilities.
- B. BHMA - Builders' Hardware Manufacturers Association.
- C. CCR - California Code of Regulations, Title 24, Part 2, California State Accessibility Standards.

- D. DHI - Door and Hardware Institute.
- E. NFPA - National Fire Protection Association.
 - 1. NFPA 80 - Fire Doors and Windows
 - 2. NFPA 101 - Life Safety Code
 - 3. NFPA 105 - Smoke and Draft Control Door Assemblies
- F. CBC 2001 - California Building Code.
- G. UL - Underwriters Laboratories.
 - 1. UL 10C - Fire Tests of Door Assemblies
 - 2. UL 305 - Panic Hardware
- H. WHI - Warnock Hersey Incorporated
- I. SDI - Steel Door Institute

1.4 SUBMITTALS & SUBSTITUTIONS

- A. General: Submit in accordance with Conditions of the Contract and Division 1 Specification sections.
- B. Submit product data (catalog cuts) including manufacturers' technical product information for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
- C. Submit six (6) copies of schedule organized vertically into "Hardware Sets" with index of doors and headings, indicating complete designations of every item required for each door or opening. Include following information:
 - 1. Type, style, function, size and finish of each hardware item.
 - 2. Name, part number and manufacturer of each item.
 - 3. Fastenings and other pertinent information.
 - 4. Location of hardware set coordinated with floor plans and door schedule.
 - 5. Explanation of all abbreviations, symbols and codes contained in schedule.
 - 6. Mounting locations for hardware.
 - 7. Door and frame sizes and materials.
 - 8. List of manufacturers used and their nearest representative with address and phone number.
 - 9. Keying information.
- D. Make substitution requests in accordance with Division 1. Substitution requests must be made prior to bid date. Include product data and indicate benefit to the project. Furnish samples of any proposed substitution.
- E. Wiring Diagrams: Provide product data and wiring and riser diagrams for all electrical products listed in the Hardware Schedule portion of this section.

FINISH HARDWARE

- F. Keying Schedule: Submit separate detailed schedule indicating clearly how the Owner's final instructions on keying of locks has been fulfilled.
- G. Templates for doors, frames, and other work specified to be factory prepared for the installation of door hardware. Check shop drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- H. Furnish as-built/as-installed schedule with close-out documents, including keying schedule, wiring/riser diagrams, manufacturers' installation, adjustment and maintenance information.

1.5 QUALITY ASSURANCE

- A. Obtain each type of hardware (latch and lock sets, hinges, closers, exit devices, etc.) from a single manufacturer.
- B. Supplier Qualifications: A recognized architectural door hardware supplier, with warehousing facilities in the project's vicinity, that has a record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this project and that employs an experienced architectural hardware consultant (AHC) who is available to Owner, Architect, and Contractor, at reasonable times during the course of the Work, for consultation.
 1. Responsible for detailing, scheduling and ordering of finish hardware.
 2. Meet with Owner to finalize keying requirements and to obtain final instructions in writing.
 3. Stock parts for products supplied and be capable of repairing and replacing hardware items found defective within warranty periods.
- C. Hardware Installer: Company specializing in the installation of commercial door hardware with five years documented experience.
- D. Fire-Rated Openings: Provide door hardware for fire-rated openings that complies with NFPA Standard No. 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and tested by UL or Warnock Hersey for given type/size opening and degree of label. Provide proper latching hardware, door closers, approved-bearing hinges and seals whether listed in the Hardware Schedule or not.
- E. Where emergency exit devices are required on fire-rated doors, (with supplementary marking on doors' UL labels indicating "Fire Door to be Equipped with Fire Exit Hardware") provide UL label on exit devices indicating "Fire Exit Hardware".
- F. Exit Doors: Operable from inside with single motion without the use of a key or special knowledge or effort.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Coordinate delivery of packaged hardware items to the appropriate locations (shop or field) for installation.
- B. Hardware items shall be individually packaged in manufacturers' original containers, complete with proper fasteners. Clearly mark packages on outside to indicate contents and locations in hardware schedule and in work.
- C. Provide locked storage area for hardware, protect from moisture, sunlight, paint, chemicals, etc.

- D. Inventory door hardware jointly with representatives of hardware supplier and hardware installer until each is satisfied that count is correct.

1.7 WARRANTY

- A. Provide warranties of respective manufacturers' regular terms of sale from day of final acceptance as follows:
 - 1. Locksets: Seven (7) years.
 - 2. Closers: Ten (10) years, except electronic closers shall be two (2) years.
 - 3. Exit devices: Three (3) years.
 - 4. All other hardware: Two (2) years.

1.8 MAINTENANCE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

1.9 PRE-INSTALLATION CONFERENCE

- A. Convene a pre-installation conference at least one week prior to beginning work of this section.
- B. Attendance: Architect, Construction Manager, Contractor, Security Contractor, Hardware Supplier, Installer, and Key District Personnel.
- C. Agenda: Review hardware schedule, products, installation procedures and coordination required with related work. Review District's keying standards.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

	<u>Item</u>	<u>Manufacturer</u>	<u>Acceptable Substitutes</u>
A.	Hinges	Ives	Hager, Stanley, McKinney
B.	Locks, Latches & Cylinders	Schlage	None
C.	Exit Devices	Von Duprin	None
D.	Closers	LCN	None
E.	Push, Pulls & Protection Plates	Ives	Trimco, BBW, Quality
F.	Flush Bolts	Ives	Trimco, BBW, Quality
G.	Dust Proof Strikes	Ives	Trimco, BBW, Quality
H.	Coordinators	Ives	Trimco, BBW, Quality
I.	Stops	Ives	Trimco, BBW, Quality

FINISH HARDWARE

J.	Overhead Stops	Glynn-Johnson	None
K.	Thresholds	National Guard	Pemko, Zero
L.	Seals & Bottoms	National Guard	Pemko, Zero

2.2 MATERIALS

- A. Hinges: Exterior out-swinging door butts shall be non-ferrous material and shall have stainless steel hinge pins. All doors to have non-rising pins.
1. Hinges shall be sized in accordance with the following:
 - a. Height:
 - 1) Doors up to 41" wide: 4-1/2" inches.
 - 2) Doors 42" to 48" wide: 5 inches.
 - b. Width: Sufficient to clear frame and trim when door swings 180 degrees.
 - c. Number of Hinges: Furnish 3 hinges per leaf to 7'-5" in height. Add one for each additional 2 feet in height.
 2. Furnish non-removable pins (NRP) at all exterior out-swing doors and interior key lock doors with reverse bevels.
- B. Floor Closers: Shall be equipped with compression springs, cam and roller operating mechanism and a one piece spindle-cam for maximum operating performance and longevity.
- C. Pivots: High strength forgings and castings with precision bearings for smooth operation. Positive locking vertical adjustment mechanism to allow installer to precisely position the door and balance the load.
- D. Continuous Hinges: As manufactured by Ives, an Ingersoll-Rand Company. UL rated as required.
- E. Heavy Duty Cylindrical Locks and Latches: Schlage "ND" Series as scheduled with "Sparta" design, fastened with through-bolts and threaded chassis hubs.
1. Locksets to comply with ANSI A156.2, Series 4000, Grade 1; tested to exceed 3,000,000 cycles. Locksets shall meet ANSI A117.1, Accessible Code.
 2. Chassis: One piece modular assembly and multi-functional allowing function interchange without disassembly of lockset.
 3. Spindle shall be deep-draw manufactured not stamped. Spindle and spring cage to be one-piece integrated assembly.
 4. Anti-rotation plate to be interlocking to the lock chassis. Lock design utilizing bit-tabs are not acceptable.
 5. Lever Trim: Accessible design, bi-directional, independent assemblies.
 6. Locks shall be of such construction that when locked, the door may be opened from within by using lever and without the use of a key or special knowledge.
 7. Thru-bolts to secure anti-rotation plate without sheer line. Fully threaded thru-bolts are not acceptable.
 8. Spring cage to have double compression springs. Manufacturers utilizing torsion springs are not acceptable.
 9. Latchbolt to be steel with minimum 1/2" throw deadlatch on keyed and exterior functions; 3/4" throw anti-friction latchbolt on pairs of doors.

10. Strikes: ANSI curved lip, 1-1/4" x 4-7/8", with 1" deep dust box (K510-066). Lips shall be of sufficient length to clear trim and protect clothing.
- F. Deadlocks: Rotating cylinder trim rings of attack-resistant design. Mounting plates and actuator shields of plated cold-rolled steel. Mounting screws of 1/4" diameter steel and protected by drill-resistant ball bearings. Steel alloy deadbolt with hardened steel roller. Strike alloy deadbolt with reinforcer and two 3" long screws. ANSI A156.5, 2001 Grade 1 certified.
- G. Exit devices: Von Duprin as scheduled.
1. Provide certificate by independent testing laboratory that device has completed over 1,000,000 cycles and can still meet ANSI/BHMA A156.3 - 2001 standards.
 2. All internal parts shall be of cold-rolled steel with zinc dichromate coating.
 3. Mechanism case shall have an average thickness of .140".
 4. Compression spring engineering.
 5. Non-handed basic device design with center case interchangeable with all functions.
 6. All devices shall have quiet return fluid dampeners.
 7. All latchbolts shall be deadlocking with 3/4" throw and have a self-lubricating coating to reduce friction and wear.
 8. Device shall bear UL label for fire and or panic as may be required.
 9. All surface strikes shall be roller type and utilize a plate underneath to prevent movement.
 10. Lever Trim: "Breakaway" design, forged brass or bronze escutcheon with a minimum of .130" thickness, match lockset lever design.
 11. Removable Mullions: Removable with single turn of building key. Securely reinstalled without need for key.
 12. Furnish glass bead kits for vision lites where required.
 13. All Exit Devices to be sex-bolted to the doors.
 14. Panic Hardware shall comply with UBC Standard 10-4 and shall be mounted between 30" and 44" above the finished floor surface. The unlatching force shall not exceed 15 lbs. applied in the direction of travel. Panic hardware shall comply with CBC Section 1003.3.1.9.
- H. Closers: LCN as scheduled. Place closers inside building, stairs, room, etc.
1. Door closer cylinders shall be of high strength cast iron construction with double heat treated pinion shaft to provide low wear operating capabilities of internal parts throughout the life of the installation. All door closers shall be tested to ANSI/BHMA A156.4 test requirements by a BHMA certified testing laboratory. A written certification showing successful completion of a minimum of 10,000,000 cycles must be provided.
 2. All door closers shall be fully hydraulic and have full rack and pinion action with a shaft diameter of a minimum of 11/16 inch and piston diameter of 1 inch to ensure longevity and durability under all closer applications.
 3. All parallel arm closers shall incorporate one piece solid forged steel arms with bronze bushings. 1-9/16" steel stud shoulder bolts, shall be incorporated in regular arms, hold-open arms, arms with hold open and stop built in. All other closers to have forged steel main arms for strength, durability, and aesthetics for versatility of trim accommodation, high strength and long life.

4. All parallel arm closers so detailed shall provide advanced backcheck for doors subject to severe abuse or extreme wind conditions. This advanced backcheck shall be located to begin cushioning the opening swing of the door at approximately 45 degrees. The intensity of the backcheck shall be fully adjustable by tamper resistant non-critical screw valve.
 5. Closers shall be installed to permit doors to swing 180 degrees.
 6. All closers shall utilize a stable fluid withstanding temperature range of 120 degrees F. to -30 degrees F. without requiring seasonal adjustment of closer speed to properly close the door.
 7. Provide the manufactures drop plates, brackets and spacers as required at narrow head rails and special frame conditions. NO wood plates or spacers will be allowed.
 8. Maximum effort to operate closers shall not exceed 5 lbs., such pull or push effort being applied at right angles to hinged doors. Compensating devices or automatic door operators may be utilized to meet the above standards. When fire doors are required, the maximum effort to operate the closer may be increased but shall not exceed 15 lbs., when specifically approved by fire marshal. All closers shall be adjusted to operate with the minimum amount of opening force and still close and latch the door. These forces do not apply to the force required to retract latch bolts or disengage other devices that hold the door in a closed position. Door shall take at least 5 seconds to move from an open position of 70 degrees to a point of 3 inches from the latch jamb. Reference CBC Sections 1133B.2.1, 1133B.2.5, 1133B2.5.1 & 1003.3.1.8.
 9. Provide sex-bolted or through bolt mounting for all door closers.
- I. Flush Bolts & Dust Proof Strikes: Automatic Flush Bolts shall be of the low operating force design. Utilize the top bolt only model for interior doors where applicable and as permitted by testing procedures.
1. Manual flush bolts only permitted on storage or mechanical openings as scheduled.
 2. Provide dust proof strikes at openings using bottom bolts.
- J. Door Stops:
1. Unless otherwise noted in Hardware Sets, provide wall type with appropriate fasteners. Where wall type cannot be used, provide floor type. If neither can be used, provide overhead type.
 2. Do not install floor stops more than four (4) inches from the face of the wall or partition (Title 24, 1133B.8.6).
 3. Overhead stops shall be made of stainless steel and non-plastic mechanisms and finished metal end caps. Field-changeable hold-open, friction and stop-only functions.
- K. Protection Plates: Fabricate either kick, armor, or mop plates with four beveled edges. Provide kick plates 10" high and 2" LDW. Sizes of armor and mop plates shall be listed in the Hardware Schedule. Furnish with machine or wood screws of bronze or stainless to match other hardware.
- L. Thresholds: As Scheduled and per details.
1. Thresholds shall not exceed 1/2" in height, with a beveled surface of 1:2 maximum slope.
 2. Set thresholds in a full bed of butyl-rubber or polyisobutylene mastic sealant complying with requirements in Division 7 "Thermal and Moisture Protection".
 3. Use 1/4" fasteners, red-head flat-head sleeve anchors (SS/FHSL).
 4. Thresholds shall comply with CBC Section 1133B.2.4.1.

- M. Seals: Provide silicone gasket at all rated and exterior doors.
 - 1. Fire-rated Doors, Resilient Seals: UL10C / UBC Standard 7-2 compliant. Coordinate with selected door manufacturers' and selected frame manufacturers' requirements.
 - 2. Fire-rated Doors, Intumescent Seals: Furnished by selected door manufacturer. Furnish fire-labeled opening assembly complete and in full compliance with UL10C / UBC Standard 7-2. Where required, intumescent seals vary in requirement by door type and door manufacture -- careful coordination required.
 - 3. *Smoke & Draft Control Doors, Provide UL10C / UBC Standard 7-2 compliant for use on "S" labeled Positive Pressure door assemblies.*
- N. Door Shoes & Door Top Caps: Provide door shoes at all exterior wood doors and top caps at all exterior out-swing doors.
- O. Silencers: Furnish silencers for interior hollow metal frames, 3 for single doors, 2 for pairs of doors. Omit where sound or light seals occurs, or for fire-resistive-rated door assemblies.

2.3 KEYING

- A. Furnish a Grand Master, Master, keyed alike or keyed different system as directed by the Owner or Architect. This is an existing Schlage Classic "F" and "Primus FP" keying system. Conduct a keying meeting with the Owner prior to ordering any locks or cylinders.
- B. Provide construction keying for doors requiring locking during construction; remove temporary cores or inserts immediately prior to Owner occupancy. Furnish permanent keys (and cores if applicable) directly to Owner.
- C. Key Blanks: Standard "6" pin bow key blank; tag to identify.
- D. Supply keys and blanks as follows:
 - 1. Supply 2 cut change keys for each different change key code.
 - 2. Supply 1 uncut key blank for each change key code.
 - 3. Supply 6 cut master keys for each different master key set.
 - 4. Supply 3 uncut key blanks for each master key set.

2.4 FINISHES

- A. Generally to be satin chrome US26D (626 on bronze and 652 on steel) unless otherwise noted.
- B. Furnish push plates, pull plates and kick or armor plates in satin stainless steel US32D (630) unless other wise noted.
- C. Door closers shall be powder-coated to match other hardware, unless otherwise noted.
- D. Aluminum items to be finished anodized aluminum except thresholds which can be furnished as standard mill finish.

2.5 FASTENERS

- A. Screws for strikes, face plates and similar items shall be flat head, countersunk type, provide machine screws for metal and standard wood screws for wood.
- B. Screws for butt hinges shall be flathead, countersunk, full-thread type.
- C. Fastening of closer bases or closer shoes to doors shall be by means of sex bolts and spray painted to match closer finish.
- D. Provide expansion anchors for attaching hardware items to concrete or masonry.
- E. All exposed fasteners shall have a phillips head.
- F. Finish of exposed screws to match surface finish of hardware or other adjacent work.
- G. All Exit Devices and Lock Protectors shall be fastened to the door by the means of sex bolts or through bolts.

PART 3 - EXECUTION**3.1 INSPECTION**

- A. Verify that doors and frames are square and plumb and ready to receive work and dimensions are as instructed by the manufacturer.
- B. Beginning of installation means acceptance of existing conditions.

3.2 INSTALLATION

- A. Install hardware in accordance with manufacturer's instructions and requirements of DHI.
- B. Use the templates provided by hardware item manufacturer.
- C. Mounting heights for hardware shall be as recommended by the Door and Hardware Institute. Operating hardware will to be located between 30" and 44" AFF.
- D. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.
- E. Drill and countersink units that are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.
- F. Set thresholds for exterior doors in full bed of butyl-rubber sealant.
- G. If hand of door is changed during construction, make necessary changes in hardware at no additional cost.

- H. Hardware Installer shall coordinate with security contractor to route cable to connect electrified locks, panic hardware and fire exit hardware to power transfers or electric hinges at the time these items are installed so as to avoid disassembly and reinstallation of hardware.
- I. Hardware Installer shall also be present with the security contractor when the power is turned on for the testing of the electronic hardware applications. Installer shall make adjustments to solenoids, latches, vertical rods and closers to insure proper and secure operation.

3.3 ADJUST AND CLEAN

- A. Adjust and check each operating item of hardware and each door, to ensure proper operation or function of every unit. Replace units which cannot be adjusted to operate freely and smoothly as intended for the application made.
- B. Clean adjacent surface soiled by hardware installation.
- C. Final Adjustment: Wherever hardware installation is made more than one month prior to acceptance or occupancy, return to that work area and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.
- D. Instruct Owner's Personnel in proper adjustment and maintenance of hardware finishes, during the final adjustment of hardware.
- E. Continued Maintenance Service: Approximately six months after the completion of the project, the Contractor accompanied by the Architectural Hardware Consultant, shall return to the project and re-adjust every item of hardware to restore proper functions of doors and hardware. Consult with and instruct Owner's personnel in recommended additions to the maintenance procedures. Replace hardware items which have deteriorated or failed due to faulty design, materials or installation of hardware units. Prepare a written report of current and predictable problems (of substantial nature) in the performance of the hardware.

3.4 LOCATIONS

- A. Conform to CCR, Title 24, Part 2, and ADAAG for positioning requirements for the disabled.

3.5 FIELD QUALITY CONTROL

- A. Architectural Hardware Consultant (AHC) to inspect installation and certify that hardware and it's installation have been furnished and installed in accordance with manufacturer's instructions and as specified herein.

3.6 SCHEDULE

- A. The items listed in the following schedule shall conform to the requirements of the foregoing specifications.

FINISH HARDWARE

B. The Door Schedule on the Drawings indicates which hardware set is used with each door.

Manufacturers Abbreviations (Mfr.)

ADA =	Adams Rite Mfg.	Aluminum Door Hardware
GLY =	Glynn-Johnson Corporation	Overhead Door Stops
IVE =	Ives	Hinges, Pivots, Bolts, Coordinators, Dust Proof Strikes, Push Pull & Kick Plates, Door Stops & Silencers
LCN =	LCN	Door Closers
NGP =	National Guard Products	Thresholds, Gasketing & Weather-stripping
SCE =	Schlage Electronics	Electronic Door Components
SCH =	Schlage Lock Company	Locks, Latches & Cylinders
VON =	Von Duprin	Exit Devices

SPECWORKS # 84580-B73J2X3GK

HW SET: 01 EXTERIOR PAIR / ALUMINUM STOREFRONT / ACCESS CONTROL

DOOR NUMBER:

109.1 202.2 203.1

EACH TO HAVE:

2	EA	POWER TRANSFER	EPT-10	689	VON
2	EA	CONTINUOUS HINGE	112HD EPT	628	IVE
1	EA	DOGGED EL DEVICE	SD-EL9947NL X 990NL	626	VON
1	EA	PANIC HARDWARE	SD-EL9947DT X 990DT	626	VON
1	EA	IC RIM CYLINDER	20-057T X ICX (CONST CORE)	626	SCH
1	EA	PERMANENT CORE	20-740 (PRIMUS)	626	SCH
2	EA	MORTISE CYLINDER	20-771 (FOR SD DOGGING)	626	SCH
2	EA	SURFACE CLOSER	4041 X 79ELR X 18G TOP JAMB/ PUSH SIDE	689	LCN
2	EA	OVERHEAD STOP	100S	630	GLY
1	SET	WEATHER SEAL	SUPPLY WITH DOOR AND FRAME ASSEMBLY		
2	EA	DOOR SWEEP	SUPPLY WITH DOOR AND FRAME ASSEMBLY		
1	EA	THRESHOLD	PER DETAIL	628	
1	EA	POWER SUPPLY	PS873-2	GRY	VON
2	EA	DOOR CONTACT	PROVIDED UNDER DIVISION 28 1300		
1	EA	RX MOTION DETECTOR	PROVIDED UNDER DIVISION 28 1300		

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08 7111-Finish Hardware

HW SET: 02 EXTERIOR PAIR / ALUMINUM STOREFRONT / ACCESS CONTROL / AUTO OPERATOR
 DOOR NUMBER:

109.2 202.1 203.2

EACH TO HAVE:

2	EA	POWER TRANSFER	EPT-10	689	VON
2	EA	CONTINUOUS HINGE	112HD EPT	628	IVE
1	EA	DOGGED EL DEVICE	SD-EL9947NL X 990NL	626	VON
1	EA	PANIC HARDWARE	SD-EL9947DT X 990DT	626	VON
1	EA	IC RIM CYLINDER	20-057T X ICX (CONST CORE)	626	SCH
1	EA	PERMANENT CORE	20-740 (PRIMUS)	626	SCH
2	EA	MORTISE CYLINDER	20-771 (FOR SD DOGGING)	626	SCH
1	EA	SURFACE CLOSER	4041 X 79ELR X 18G TOP JAMB/ PUSH SIDE	689	LCN
1	EA	AUTO-EQUALIZER	4642(CS) X 79LR X FLUSH CEILING MOUNT	689	LCN
2	EA	OVERHEAD STOP	100S	630	GLY
1	SET	WEATHER SEAL	SUPPLY WITH DOOR AND FRAME ASSEMBLY		
2	EA	DOOR SWEEP	SUPPLY WITH DOOR AND FRAME ASSEMBLY		
1	EA	THRESHOLD	PER DETAIL	628	
1	EA	POWER SUPPLY	PS873 X 2 X AO	GRY	VON
1	EA	CARD READ/KEY PAD	PROVIDED UNDER DIVISION 28 1300		
2	EA	DOOR CONTACT	PROVIDED UNDER DIVISION 28 1300		
1	EA	RX MOTION DETECTOR	PROVIDED UNDER DIVISION 28 1300		
2	EA	ACTUATOR, WALL MOUNT	8310-856		LCN
2	EA	ESCUTCHEON	8310-874	630	LCN

NOTE: AUTO OPERATOR LOCATIONS: RHR LEAF @ 109.2, RHR LEAF @202.1, LHR LEAF @ 203.2

HW SET: 03 INTERIOR / ALUM STOREFRONT / DIVISION WAITING, WELLNESS
 DOOR NUMBER:

131.1 155

EACH TO HAVE:

1	SET	PIVOT SET	7215	626	IVE
1	EA	PIVOT	7215 INT	626	IVE
1	EA	CLASSROOM LOCK	ND70RD SPA	626	SCH
1	EA	SURFACE CLOSER	4041 X 79ELR X 18G TOP JAMB/ PUSH SIDE	689	LCN
1	EA	DOME STOP	FS436	626	IVE
1	SET	DOOR SEALS	SUPPLY WITH DOOR AND FRAME ASSEMBLY		
1	EA	SILL	PER DETAIL	628	

FINISH HARDWARE

HW SET: 04 INTERIOR / ALUM STOREFRONT / OFFICE

DOOR NUMBER:

131.2 131.3

EACH TO HAVE:

1	SET PIVOT SET	7215	626	IVE
1	EA PIVOT	7215 INT	626	IVE
1	EA OFFICE LOCK	ND53RD SPA	626	SCH
1	EA OVERHEAD STOP	100S	630	GLY
1	SET DOOR SEALS	SUPPLY WITH DOOR AND FRAME ASSEMBLY		
1	EA SILL	PER DETAIL	628	

HW SET: 04A INTERIOR / ALUM STOREFRONT / OFFICE, MEETING

DOOR NUMBER:

132.1	153	271	273	275	277
304.1	306	308	325	327	329
331	333	335	337	339.1	339.2
340	341	343.1	361.1	361.2	363
365	367	369	371	373	

EACH TO HAVE:

1	SET PIVOT SET	7215	626	IVE
1	EA PIVOT	7215 INT	626	IVE
1	EA OFFICE LOCK	ND53RD SPA	626	SCH
1	EA DOME STOP	FS436	626	IVE
1	SET DOOR SEALS	SUPPLY WITH DOOR AND FRAME ASSEMBLY		
1	EA SILL	PER DETAIL	628	

HW SET: 04B INTERIOR / ALUM STOREFRONT / COPY, BREAK ROOM

DOOR NUMBER:

267 269.2 334.1

EACH TO HAVE:

1	SET PIVOT SET	7215	626	IVE
1	EA PIVOT	7215 INT	626	IVE
1	EA CLASSROOM LOCK	ND70RD SPA	626	SCH
1	EA DOME STOP	FS436	626	IVE
1	SET DOOR SEALS	SUPPLY WITH DOOR AND FRAME ASSEMBLY		
1	EA SILL	PER DETAIL	628	

HW SET: 05 INTERIOR PAIR / ALUMINUM STOREFRONT / ACCESS CONTROL / HOLD-OPEN
CLOSER

DOOR NUMBER:
110

EACH TO HAVE:

1	EA	POWER TRANSFER	EPT-10	689	VON
1	EA	CONTINUOUS HINGE	112HD	628	IVE
1	EA	CONTINUOUS HINGE	112HD EPT	628	IVE
1	EA	PANIC HARDWARE	9947EO	626	VON
1	EA	ELEC TRIM PANIC	CD9947L X E996L X 17 X FSE	626	VON
1	EA	RIM CYLINDER	20-757 (PRIMUS IC CORE RIM CYLINDER)	613	SCH
1	EA	MORTISE CYLINDER	20-771 X XQ11-948 (FOR CD DOGGING)	626	SCH
2	EA	SENTRONIC CLOSER	4040SE 24V PULL SIDE MOUNT	689	LCN
2	EA	FLOOR STOP	FS444	626	IVE
1	EA	CARD READER	PROVIDED UNDER DIVISION 28 1300		
2	EA	DOOR CONTACT	PROVIDED UNDER DIVISION 28 1300		
1	EA	POWER SUPPLY	PROVIDED UNDER DIVISION 28 1300		
1	EA	RX MOTION DETECTOR	PROVIDED UNDER DIVISION 28 1300		

NOTE: THIS OPENING HAS ELECTRIFIED TRIM. THE 4040 SE IS RELEASED BY ACAMS

HW SET: 05A INTERIOR PAIR / ALUMINUM STOREFRONT / ACCESS CONTROL / MAG HOLD-
OPEN

DOOR NUMBER:
114

EACH TO HAVE:

1	EA	POWER TRANSFER	EPT-10	689	VON
1	EA	CONTINUOUS HINGE	112HD	628	IVE
1	EA	CONTINUOUS HINGE	112HD EPT	628	IVE
1	EA	PANIC HARDWARE	9947EO	626	VON
1	EA	ELEC TRIM PANIC	CD9947L X E996L X 17 X FSE	626	VON
1	EA	RIM CYLINDER	20-757 (PRIMUS IC CORE RIM CYLINDER)	613	SCH
1	EA	MORTISE CYLINDER	20-771 X XQ11-948 (FOR CD DOGGING)	626	SCH
2	EA	SURFACE CLOSER	4041 X 79ELR X 18TJ TOP JAMB/ PUSH SIDE	689	LCN
2	EA	FLOOR STOP	FS444	626	IVE
2	EA	MAGNETIC HOLD-OPEN	SEM 7830	AL	LCN
1	EA	CARD READ/KEY PAD	PROVIDED UNDER DIVISION 28 1300		
2	EA	DOOR CONTACT	PROVIDED UNDER DIVISION 28 1300		
1	EA	POWER SUPPLY	PROVIDED UNDER DIVISION 28 1300		
1	EA	RX MOTION DETECTOR	PROVIDED UNDER DIVISION 28 1300		

NOTE: THIS OPENING HAS ELECTRIFIED TRIM. THE MAG HOLD-OPENS ARE RELEASED BY
ACAMS

FINISH HARDWARE

HW SET: 06 EXTERIOR PAIR / ALUMINUM STOREFRONT / ACCESS CONTROL / CARD READER
DOOR NUMBER:
111

EACH TO HAVE:

2	EA	POWER TRANSFER	EPT-10	689	VON
2	EA	CONTINUOUS HINGE	112HD EPT	628	IVE
1	EA	DOGGED EL DEVICE	SD-EL9947NL X 990NL	626	VON
1	EA	PANIC HARDWARE	SD-EL9947DT X 990DT	626	VON
1	EA	IC RIM CYLINDER	20-057T X ICX (CONST CORE)	626	SCH
1	EA	PERMANENT CORE	20-740 (PRIMUS)	626	SCH
2	EA	MORTISE CYLINDER	20-771 (FOR SD DOGGING)	626	SCH
2	EA	SURFACE CLOSER	4041 X 79ELR X 18G TOP JAMB/ PUSH SIDE	689	LCN
2	EA	OVERHEAD STOP	100S	630	GLY
1	SET	WEATHER SEAL	SUPPLY WITH DOOR AND FRAME ASSEMBLY		
2	EA	DOOR SWEEP	SUPPLY WITH DOOR AND FRAME ASSEMBLY		
1	EA	THRESHOLD	PER DETAIL	628	
1	EA	POWER SUPPLY	PS873-2	GRY	VON
1	EA	CARD READ/KEY PAD	PROVIDED UNDER DIVISION 28 1300		
2	EA	DOOR CONTACT	PROVIDED UNDER DIVISION 28 1300		
1	EA	RX MOTION DETECTOR	PROVIDED UNDER DIVISION 28 1300		

HW SET: 06A INTERIOR PAIR / ALUMINUM STOREFRONT / ACCESS CONTROL
DOOR NUMBER:
260.1 280.1

EACH TO HAVE:

2	EA	POWER TRANSFER	EPT-10	689	VON
2	EA	CONTINUOUS HINGE	112HD EPT	628	IVE
1	EA	DOGGED EL DEVICE	SD-EL9947NL X 990NL	626	VON
1	EA	PANIC HARDWARE	SD-EL9947DT X 990DT	626	VON
1	EA	IC RIM CYLINDER	20-057T X ICX (CONST CORE)	626	SCH
1	EA	PERMANENT CORE	20-740 (PRIMUS)	626	SCH
2	EA	MORTISE CYLINDER	20-771 (FOR SD DOGGING)	626	SCH
2	EA	SURFACE CLOSER	4041 X 79ELR X 18G TOP JAMB/ PUSH SIDE	689	LCN
2	EA	FLOOR STOP	FS444	626	IVE
2	EA	MAGNETIC HOLD-OPEN	SEM 7830	AL	LCN
1	SET	WEATHER SEAL	SUPPLY WITH DOOR AND FRAME ASSEMBLY		
1	EA	THRESHOLD	PER DETAIL	628	
1	EA	POWER SUPPLY	PS873-2	GRY	VON
2	EA	DOOR CONTACT	PROVIDED UNDER DIVISION 28 1300		
1	EA	RX MOTION DETECTOR	PROVIDED UNDER DIVISION 28 1300		

NOTE: THIS IS A SCHEDULED LOCK AND UNLOCK OPENING.

HW SET: 06B INTERIOR PAIR / ALUMINUM STOREFRONT / ACCESS CONTROL / CARD READER
 DOOR NUMBER:
 260.2

EACH TO HAVE:

2	EA	POWER TRANSFER	EPT-10	689	VON
2	EA	CONTINUOUS HINGE	112HD EPT	628	IVE
1	EA	DOGGED EL DEVICE	SD-EL9947NL X 990NL	626	VON
1	EA	PANIC HARDWARE	SD-EL9947DT X 990DT	626	VON
1	EA	IC RIM CYLINDER	20-057T X ICX (CONST CORE)	626	SCH
2	EA	PERMANENT CORE	20-740 (PRIMUS)	626	SCH
2	EA	MORTISE CYLINDER	20-771 (FOR SD DOGGING)	626	SCH
2	EA	SURFACE CLOSER	4041 X 79ELR X 18G TOP JAMB/ PUSH SIDE	689	LCN
2	EA	FLOOR STOP	FS444	626	IVE
2	EA	MAGNETIC HOLD-OPEN	SEM 7830	AL	LCN
1	SET	WEATHER SEAL	SUPPLY WITH DOOR AND FRAME ASSEMBLY		
1	EA	THRESHOLD	PER DETAIL	628	
1	EA	POWER SUPPLY	PS873-2	GRY	VON
1	EA	CARD READ/KEY PAD	PROVIDED UNDER DIVISION 28 1300		
2	EA	DOOR CONTACT	PROVIDED UNDER DIVISION 28 1300		
1	EA	RX MOTION DETECTOR	PROVIDED UNDER DIVISION 28 1300		

HW SET: 07 INTERIOR / STORAGE
 DOOR NUMBER:

130 220.3 301 332

EACH TO HAVE:

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	ND80TD SPA	626	SCH
1	EA	PERMANENT CORE	20-740 (PRIMUS)	626	SCH
1	EA	DOME STOP	FS436	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 07A INTERIOR / CLASSROOM STORAGE, FILE ROOM
 DOOR NUMBER:

253.2 303 315 345 360.5 370.3
 380.3

EACH TO HAVE:

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	ND80RD SPA	626	SCH
1	EA	DOME STOP	FS436	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

FINISH HARDWARE

HW SET: 08 INTERIOR / RATED / CORRIDOR, CLASSROOM
DOOR NUMBER:
112

EACH TO HAVE:

3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	CLASSROOM LOCK	ND70RD SPA	626	SCH
1	EA	SURFACE CLOSER	4041 EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	DOME STOP	FS436	626	IVE
1	SET	GASKET	PER SELECTED DOOR MFGR		

HW SET: 09 INTERIOR / RATED / ELEC, ELEV,
DOOR NUMBER:

101 103 142 210 272 321

EACH TO HAVE:

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	ND80TD SPA	626	SCH
1	EA	PERMANENT CORE	20-740 (PRIMUS)	626	SCH
1	EA	SURFACE CLOSER	4041	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	DOME STOP	FS436	626	IVE
1	SET	SEALS	2525B	BRN	NGP

HW SET: 09A INTERIOR / RATED / EQUIP, MECH
DOOR NUMBER:

104.2 265 310

EACH TO HAVE:

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	ND80TD SPA	626	SCH
1	EA	PERMANENT CORE	20-740 (PRIMUS)	626	SCH
1	EA	SURFACE CLOSER	4041	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	DOME STOP	FS436	626	IVE
1	SET	GASKET	PER SELECTED DOOR MFGR		

HW SET: 10 INTERIOR / RATED / FACILITIES & MAINT OP
DOOR NUMBER:

102 104.1

EACH TO HAVE:

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	OFFICE LOCK	ND53TD SPA	626	SCH
1	EA	PERMANENT CORE	20-740 (PRIMUS)	626	SCH
1	EA	SURFACE CLOSER	4041	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	DOME STOP	FS436	626	IVE
1	SET	GASKET	PER SELECTED DOOR MFGR		

HW SET: 10A INTERIOR / FACILITIES & MAINT OP
 DOOR NUMBER:

152 250 261 350 351

EACH TO HAVE:

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	OFFICE LOCK	ND53TD SPA	626	SCH
1	EA	PERMANENT CORE	20-740 (PRIMUS)	626	SCH
1	EA	SURFACE CLOSER	4041	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	DOMESTOP	FS436	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 11 INTERIOR / RATED / TRANSFORMER
 DOOR NUMBER:

106.1

EACH TO HAVE:

3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	STOREROOM LOCK	ND80TD SPA	626	SCH
1	EA	PERMANENT CORE	20-740 (PRIMUS)	626	SCH
1	EA	SURFACE CLOSER	4041 EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	DOMESTOP	FS436	626	IVE
1	SET	SEALS	2525B	BRN	NGP

HW SET: 11A INTERIOR / RATED / FIRE RISER ROOM
 DOOR NUMBER:

160.1 279 375

EACH TO HAVE:

3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	STOREROOM LOCK	ND80TD SPA	626	SCH
1	EA	PERMANENT CORE	20-740 (PRIMUS)	626	SCH
1	EA	SURFACE CLOSER	4041 EDA	689	LCN
1	EA	DOMESTOP	FS436	626	IVE
1	SET	GASKET	PER SELECTED DOOR MFGR		

HW SET: 11B INTERIOR / STORGE
 DOOR NUMBER:

170.5

EACH TO HAVE:

3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	STOREROOM LOCK	ND80TD SPA	626	SCH
1	EA	PERMANENT CORE	20-740 (PRIMUS)	626	SCH
1	EA	OVERHEAD STOP	100S	630	GLY
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

FINISH HARDWARE

HW SET: 12 INTERIOR PAIR / RATED / TRANSFORMER
DOOR NUMBER:
106.2

EACH TO HAVE:

6	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
2	EA	MANUAL FLUSH BOLT	FB457	626	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	STOREROOM LOCK	ND80TD SPA 14-042	626	SCH
1	EA	PERMANENT CORE	20-740 (PRIMUS)	626	SCH
1	EA	ASTRAGAL	139SP / OR BY DOOR MFG	600	NGP
1	EA	SURFACE CLOSER	4041 PA @ ACTIVE LEAF	689	LCN
1	SET	SEALS	2525B	BRN	NGP

HW SET: 12A INTERIOR PAIR / RATED / ELEC
DOOR NUMBER:
160.2 281 377

EACH TO HAVE:

6	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
2	EA	MANUAL FLUSH BOLT	FB358	626	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	STOREROOM LOCK	ND80TD SPA 14-042	626	SCH
1	EA	PERMANENT CORE	20-740 (PRIMUS)	626	SCH
1	EA	SURFACE CLOSER	4041 PA @ ACTIVE LEAF	689	LCN
1	SET	GASKET	PER SELECTED DOOR MFGR		

HW SET: 12B INTERIOR PAIR / STORAGE
DOOR NUMBER:
160.3 160.4 160.5 255.3

EACH TO HAVE:

6	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
2	EA	MANUAL FLUSH BOLT	FB358	626	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	STOREROOM LOCK	ND80RD SPA	626	SCH
2	EA	DOME STOP	FS436	626	IVE
2	EA	SILENCER	SR64	GRY	IVE

HW SET: 12C INTERIOR PAIR / YOGA STORAGE

DOOR NUMBER:
 257.2 257.3

EACH TO HAVE:

6	EA	HINGE	5BB1HW 5 X 4.5 NRP	652	IVE
2	EA	MANUAL FLUSH BOLT	FB358	626	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	STOREROOM LOCK	ND80RD SPA	626	SCH
2	EA	OVERHEAD STOP	100S	630	GLY
2	EA	SILENCER	SR64	GRY	IVE

HW SET: 12D INTERIOR PAIR / RATED / MECH ROOM

DOOR NUMBER:
 105

EACH TO HAVE:

6	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
2	EA	MANUAL FLUSH BOLT	FB358	626	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	STOREROOM LOCK	ND80TD SPA 14-042	626	SCH
1	EA	PERMANENT CORE	20-740 (PRIMUS)	626	SCH
1	EA	SURFACE CLOSER	4041	689	LCN
1	SET	GASKET	PER SELECTED DOOR MFGR		

HW SET: 13 OVERHEAD COILING DOOR / CARD READER

DOOR NUMBER:
 108.1

EACH TO HAVE:

1	SET		BALANCE OF HARDWARE BY DOOR MFG		
1	EA	CARD READER	PROVIDED UNDER DIVISION 28 1300		
1	EA	DOOR CONTACT	PROVIDED UNDER DIVISION 28 1300		
1	EA	CYLINDER	TO MATCH DIST STANDARD IF REQUIRED		SCH

HW SET: 13A SLIDING DOOR

DOOR NUMBER:
 201.2 201.3

EACH TO HAVE:

1	SET		BALANCE OF HARDWARE BY DOOR MFG		
1	EA	DOOR CONTACT	PROVIDED UNDER DIVISION 28 1300		

FINISH HARDWARE

HW SET: 13B OVERHEAD COILING DOOR
DOOR NUMBER:
270.2

EACH TO HAVE:

1	SET	BALANCE OF HARDWARE BY DOOR MFG	
1	EA CYLINDER	TO MATCH DIST STANDARD IF REQUIRED	SCH

HW SET: 14 INTERIOR / RATED / POOL DECK STORAGE
DOOR NUMBER:
108.2

EACH TO HAVE:

3	EA HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA STOREROOM LOCK	ND80TD SPA	626	SCH
1	EA PERMANENT CORE	20-740 (PRIMUS)	626	SCH
1	EA SURFACE CLOSER	4041 EDA	689	LCN
1	EA KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA DOME STOP	FS436	626	IVE
1	SET GASKET	PER SELECTED DOOR MFGR		
1	EA THRESHOLD	PER DETAIL	628	

HW SET: 15 EXTERIOR / LOCKER ROOM / ACCESS CONTROL
DOOR NUMBER:
140.1 150.1

EACH TO HAVE:

1	EA POWER TRANSFER	EPT-10	689	VON
1	EA CONTINUOUS HINGE	112HD EPT	628	IVE
1	EA PANIC HARDWARE	CD99L E996L X 17 X FSE	626	VON
1	EA IC RIM CYLINDER	20-057T X ICX (CONST CORE)	626	SCH
1	EA PERMANENT CORE	20-740 (PRIMUS)	626	SCH
1	EA MORTISE CYLINDER	20-771 X XQ11-948 (FOR CD DOGGING)	626	SCH
1	EA SURFACE CLOSER	4041 EDA	689	LCN
1	EA KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA FLOOR STOP	FS444	626	IVE
1	SET SEALS	2525B		BRN NGP
1	EA DOOR SWEEP	200NA 36"		AL NGP
1	EA THRESHOLD	PER DETAIL	628	
1	EA DOOR CONTACT	PROVIDED UNDER DIVISION 28 1300		
1	EA POWER SUPPLY	PROVIDED UNDER DIVISION 28 1300		
1	EA RX MOTION DETECTOR	PROVIDED UNDER DIVISION 28 1300		

NOTE: THIS OPENING HAS ELECTRIFIED TRIM. IT IS A SCHEDULED LOCK AND UNLOCK OPENING.

HW SET: 16 INTERIOR / CHANGING ROOM, ADAPTED LOCKERS

DOOR NUMBER:

140.2 150.2 151 170.6 280.2 317

EACH TO HAVE:

3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	CLASSROOM LOCK	ND70RD SPA	626	SCH
1	EA	SURFACE CLOSER	4041	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	DOME STOP	FS436	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 16A INTERIOR / DENTAL LAB / ACCESS CONTROL

DOOR NUMBER:

330.1

EACH TO HAVE:

2	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	ELECTRIC HINGE	5BB1HW 4.5 X 4.5 TW4	652	IVE
1	EA	PERMANENT CORE	20-740 (PRIMUS)	626	SCH
1	EA	EU STOREROOM LOCK	ND80TDEU SPA	626	SCH
1	EA	SENTRONIC CLOSER	4040SE 24V PULL SIDE MOUNT	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	DOME STOP	FS436	626	IVE
3	EA	SILENCER	SR64	GRY	IVE
1	EA	DOOR CONTACT	PROVIDED UNDER DIVISION 28 1300		
1	EA	POWER SUPPLY	PROVIDED UNDER DIVISION 28 1300		
1	EA	RX MOTION DETECTOR	PROVIDED UNDER DIVISION 28 1300		

NOTE: THIS IS A SCHEDULED LOCK AND UNLOCK OPENING. THIS OPENING HAS AN ELECTRIFIED HOLD-OPEN CLOSER THAT IS TIED INTO THE ACAMS.

HW SET: 16B INTERIOR / DENTAL LAB / ACCESS CONTROL / CARD READER

DOOR NUMBER:

330.2

EACH TO HAVE:

2	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	ELECTRIC HINGE	5BB1HW 4.5 X 4.5 TW4	652	IVE
1	EA	PERMANENT CORE	20-740 (PRIMUS)	626	SCH
1	EA	EU STOREROOM LOCK	ND80TDEU SPA	626	SCH
1	EA	SURFACE CLOSER	4041	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	DOME STOP	FS436	626	IVE
1	EA	MAGNETIC HOLD-OPEN	SEM 7830	AL	LCN
3	EA	SILENCER	SR64	GRY	IVE
1	EA	CARD READ/KEY PAD	PROVIDED UNDER DIVISION 28 1300		
1	EA	DOOR CONTACT	PROVIDED UNDER DIVISION 28 1300		
1	EA	POWER SUPPLY	PROVIDED UNDER DIVISION 28 1300		
1	EA	RX MOTION DETECTOR	PROVIDED UNDER DIVISION 28 1300		

FINISH HARDWARE

HW SET: 17 INTERIOR / ADAPTED ASSESS.

DOOR NUMBER:

170.9 230

EACH TO HAVE:

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	OFFICE LOCK	ND53RD SPA	626	SCH
1	EA	DOME STOP	FS436	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 17A INTERIOR / ADAPTED ASSESS.

DOOR NUMBER:

170.8

EACH TO HAVE:

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	OFFICE LOCK	ND53RD SPA	626	SCH
1	EA	OVERHEAD STOP	100S	630	GLY
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 18 INTERIOR PAIR / ALUMINUM STOREFRONT

DOOR NUMBER:

170.1

EACH TO HAVE:

2	SET	PIVOT SET	7215	626	IVE
2	EA	PIVOT	7215 INT	626	IVE
1	SET	HEAD/THRESHOLD BOLT	4015 X 4085	603	ADA
1	EA	MORTISE THUMBTURN	4066	628	ADA
1	EA	DEADLOCK	MS1850S	628	ADA
1	EA	MORTISE CYLINDER	20-062 (FOR MS LOCK)	626	SCH
1	EA	EXIT INDICATOR	4089	628	ADA
1	EA	CYLINDER GUARD	MS4043-01 1/4"	603	ADA
2	EA	PULL/PUSHBAR	9190-0	630	IVE
2	EA	SURFACE CLOSER	4021 X 18G (TOP JAMB MOUNTED)	689	LCN
2	EA	DOME STOP	FS436	626	IVE
1	SET	DOOR SEALS	SUPPLY WITH DOOR AND FRAME ASSEMBLY		
1	EA	SILL	PER DETAIL	628	

HW SET: 19 EXTERIOR / ACCESS CONTROL / CARD READER
DOOR NUMBER:
170.4

EACH TO HAVE:

1	EA	POWER TRANSFER	EPT-10	689	VON
1	EA	CONTINUOUS HINGE	112HD EPT	628	IVE
1	EA	PANIC HARDWARE	CD99L E996L X 17 X FSE	626	VON
1	EA	IC RIM CYLINDER	20-057T X ICX (CONST CORE)	626	SCH
1	EA	PERMANENT CORE	20-740 (PRIMUS)	626	SCH
1	EA	MORTISE CYLINDER	20-771 X XQ11-948 (FOR CD DOGGING)	626	SCH
1	EA	SURFACE CLOSER	4041 EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	FLOOR STOP	FS444	626	IVE
1	SET	SEALS	2525B	BRN	NGP
1	EA	DOOR SWEEP	200NA 36"	AL	NGP
1	EA	THRESHOLD	PER DETAIL	628	
1	EA	CARD READ/KEY PAD	PROVIDED UNDER DIVISION 28 1300		
1	EA	DOOR CONTACT	PROVIDED UNDER DIVISION 28 1300		
1	EA	POWER SUPPLY	PROVIDED UNDER DIVISION 28 1300		
1	EA	RX MOTION DETECTOR	PROVIDED UNDER DIVISION 28 1300		

NOTE: THIS OPENING HAS ELECTRIFIED TRIM.

HW SET: 19A EXTERIOR / ACCESS CONTROL
DOOR NUMBER:
170.7

EACH TO HAVE:

1	EA	POWER TRANSFER	EPT-10	689	VON
1	EA	CONTINUOUS HINGE	112HD EPT	628	IVE
1	EA	PANIC HARDWARE	CD99L E996L X 17 X FSE	626	VON
1	EA	IC RIM CYLINDER	20-057T X ICX (CONST CORE)	626	SCH
1	EA	PERMANENT CORE	20-740 (PRIMUS)	626	SCH
1	EA	MORTISE CYLINDER	20-771 X XQ11-948 (FOR CD DOGGING)	626	SCH
1	EA	SURFACE CLOSER	4041 EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	FLOOR STOP	FS444	626	IVE
1	SET	SEALS	2525B	BRN	NGP
1	EA	DOOR SWEEP	200NA 36"	AL	NGP
1	EA	THRESHOLD	PER DETAIL	628	
1	EA	DOOR CONTACT	PROVIDED UNDER DIVISION 28 1300		
1	EA	POWER SUPPLY	PROVIDED UNDER DIVISION 28 1300		
1	EA	RX MOTION DETECTOR	PROVIDED UNDER DIVISION 28 1300		

NOTE: THIS OPENING HAS ELECTRIFIED TRIM. IT IS A SCHEDULED LOCK AND UNLOCK OPENING.

FINISH HARDWARE

HW SET: 20 INTERIOR / RATED / STAIR / MAG HOLD-OPEN
DOOR NUMBER:
S13.1

EACH TO HAVE:

3	EA	HINGE	5BB1HW 5 X 4.5 NRP	652	IVE
1	EA	FIRE EXIT HARDWARE	99L-F 996L X 17	626	VON
1	EA	IC RIM CYLINDER	20-057T X ICX (CONST CORE)	626	SCH
1	EA	CORE ONLY	23-030 (CLASSIC F)	626	SCH
1	EA	SURFACE CLOSER	4041 EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	FLOOR STOP	FS444	626	IVE
1	EA	MAGNETIC HOLD-OPEN	SEM 7830	AL	LCN
1	SET	GASKET	PER SELECTED DOOR MFGR		

HW SET: 21 INTERIOR PAIR / RATED / MAG HOLD-OPEN
DOOR NUMBER:
S13.2

EACH TO HAVE:

6	EA	HINGE	5BB1HW 5 X 4.5 NRP	652	IVE
1	EA	FIRE EXIT HARDWARE	9927EO-F-LBR	626	VON
1	EA	FIRE EXIT HARDWARE	9927L-F-LBR 996L X 17	626	VON
1	EA	IC RIM CYLINDER	20-057T X ICX (CONST CORE)	626	SCH
1	EA	CORE ONLY	23-030 (CLASSIC F)	626	SCH
2	EA	SURFACE CLOSER	4041 EDA	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
2	EA	FLOOR STOP	FS444	626	IVE
2	EA	MAGNETIC HOLD-OPEN	SEM 7830	AL	LCN
1	SET	GASKET	PER SELECTED DOOR MFGR		

HW SET: 21A INTERIOR PAIR / RATED / MAG HOLD-OPEN / DOOR WIDTH TO BE VERIFIED
DOOR NUMBER:
S31

EACH TO HAVE:

8	EA	HINGE	5BB1HW 5 X 4.5 NRP	652	IVE
1	EA	FIRE EXIT HARDWARE	9927EO-F-LBR	626	VON
1	EA	FIRE EXIT HARDWARE	9927L-F-LBR 996L X 17	626	VON
1	EA	IC RIM CYLINDER	20-057T X ICX (CONST CORE)	626	SCH
1	EA	CORE ONLY	23-030 (CLASSIC F)	626	SCH
2	EA	SURFACE CLOSER	4041 EDA	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
2	EA	FLOOR STOP	FS444	626	IVE
2	EA	MAGNETIC HOLD-OPEN	SEM 7830	AL	LCN
1	SET	GASKET	PER SELECTED DOOR MFGR		

NOTE: CONTRACTOR TO MAINTAIN A WIDTH OF 7'0" FROM THE FACE OF ONE DOOR TO THE FACE OF THE OTHER DOOR IN AN OPEN POSITION. ADJUST DOOR OPENING SIZE AS NECESSARY.

HW SET: 21B INTERIOR PAIR / RATED / MAG HOLD-OPEN
 DOOR NUMBER:
 S21.2

EACH TO HAVE:

8	EA	HINGE	5BB1HW 5 X 4.5 NRP	652	IVE
1	EA	FIRE EXIT HARDWARE	9927EO-F-LBR	626	VON
1	EA	FIRE EXIT HARDWARE	9927L-F-LBR 996L X 17	626	VON
1	EA	IC RIM CYLINDER	20-057T X ICX (CONST CORE)	626	SCH
1	EA	CORE ONLY	23-030 (CLASSIC F)	626	SCH
2	EA	SURFACE CLOSER	4041 EDA	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
2	EA	FLOOR STOP	FS444	626	IVE
2	EA	MAGNETIC HOLD-OPEN	SEM 7830	AL	LCN
1	SET	GASKET	PER SELECTED DOOR MFGR		

HW SET: 21C INTERIOR PAIR / RATED / MAG HOLD-OPEN
 DOOR NUMBER:
 S23.1

EACH TO HAVE:

8	EA	HINGE	5BB1HW 5 X 4.5 NRP	652	IVE
1	EA	FIRE EXIT HARDWARE	9927EO-F-LBR	626	VON
1	EA	FIRE EXIT HARDWARE	9927L-F-LBR 996L X 17	626	VON
1	EA	IC RIM CYLINDER	20-057T X ICX (CONST CORE)	626	SCH
1	EA	CORE ONLY	23-030 (CLASSIC F)	626	SCH
2	EA	SURFACE CLOSER	4041 EDA	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
2	EA	FLOOR STOP	FS444	626	IVE
2	EA	MAGNETIC HOLD-OPEN	SEM 7830	AL	LCN
1	SET	GASKET	PER SELECTED DOOR MFGR		

FINISH HARDWARE

HW SET: 22 EXTERIOR / STAIR / ACCESS CONTROL / LOCAL ALARM
DOOR NUMBER:
S13.3

EACH TO HAVE:

1	EA	CONTINUOUS HINGE	112HD	628	IVE
1	EA	PANIC HARDWARE	99EO (EMERG EXIT ONLY, PUSH TO OPEN SOUND..)	626	VON
1	EA	RIM CYLINDER	20-757 (PRIMUS IC CORE RIM CYL) FOR EXIT ALARM	613	SCH
1	EA	SURFACE CLOSER	4041 EDA	689	LCN
1	EA	FLOOR STOP	FS444	626	IVE
1	SET	SEALS	2525B	BRN	NGP
1	EA	DOOR SWEEP	200NA 36"	AL	NGP
1	EA	THRESHOLD	PER DETAIL	628	
1	EA	DOOR CONTACT	PROVIDED UNDER DIVISION 28 1300		
1	EA	LOCAL EXIT ALARM	PROVIDED UNDER DIVISION 28 1300		
1	EA	POWER SUPPLY	PROVIDED UNDER DIVISION 28 1300		

NOTE: THE PANIC DEVICE USES THE RED SILK SCREENED TOUCHBAR WITH "EMERGENCY
EXIT ONLY, PUSH TO OPEN AND SOUND ALARM" BUT IS NOT ELECTRIFIED.

HW SET: 22A EXTERIOR / STAIR / ACCESS CONTROL / LOCAL ALARM
DOOR NUMBER:
S14.2

EACH TO HAVE:

1	EA	CONTINUOUS HINGE	112HD	628	IVE
1	EA	PANIC HARDWARE	99EO	626	VON
1	EA	SURFACE CLOSER	4041 EDA	689	LCN
1	EA	FLOOR STOP	FS444	626	IVE
1	SET	SEALS	2525B	BRN	NGP
1	EA	DOOR SWEEP	200NA 36"	AL	NGP
1	EA	THRESHOLD	PER DETAIL	628	
1	EA	DOOR CONTACT	PROVIDED UNDER DIVISION 28 1300		
1	EA	RX MOTION DETECTOR	PROVIDED UNDER DIVISION 28 1300		

HW SET: 23 INTERIOR / RATED / ACCESS CONTROL / LOCAL ALARM

DOOR NUMBER:

S14.1 S14.3

EACH TO HAVE:

2	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	FIRE EXIT HARDWARE	99EO-F (EMER EXIT ONLY,PUSH TO OPEN...)	626	VON
1	EA	RIM CYLINDER	20-757 (PRIMUS IC CORE RIM CYL) FOR EXIT ALARM	613	SCH
1	EA	SURFACE CLOSER	4041 EDA	689	LCN
1	EA	FLOOR STOP	FS444	626	IVE
1	SET	GASKET	PER SELECTED DOOR MFGR		
1	EA	THRESHOLD	PER DETAIL	628	
1	EA	DOOR CONTACT	PROVIDED UNDER DIVISION 28 1300		
1	EA	LOCAL EXIT ALARM	PROVIDED UNDER DIVISION 28 1300		
1	EA	POWER SUPPLY	PROVIDED UNDER DIVISION 28 1300		

NOTE: THE PANIC DEVICE USES THE RED SILK SCREENED TOUCHBAR WITH "EMERGENCY EXIT ONLY, PUSH TO OPEN AND SOUND ALARM" BUT IS NOT ELECTRIFIED.

HW SET: 23A INTERIOR / RATED / ACCESS CONTROL / LOCAL ALARM

DOOR NUMBER:

S23.2 S33

EACH TO HAVE:

2	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	ELECTRIC HINGE	5BB1HW 4.5 X 4.5 TW8	652	IVE
1	EA	PANIC HARDWARE	99L-F X E996L X 17 X FS (FAIL SAFE) (LOCAL ALARM)	626	VON
1	EA	IC RIM CYLINDER	20-057T X ICX (CONST CORE)	626	SCH
1	EA	PERMANENT CORE	20-740 (PRIMUS)	626	SCH
1	EA	RIM CYLINDER	20-757 (PRIMUS IC CORE RIM CYL) FOR EXIT ALARM	613	SCH
1	EA	SURFACE CLOSER	4041 EDA	689	LCN
1	EA	FLOOR STOP	FS444	626	IVE
1	SET	GASKET	PER SELECTED DOOR MFGR		
1	EA	THRESHOLD	PER DETAIL	628	
1	EA	POWER SUPPLY	PS873-FA	GRY	VON
1	EA	DOOR CONTACT	PROVIDED UNDER DIVISION 28 1300		
1	EA	LOCAL EXIT ALARM	PROVIDED UNDER DIVISION 28 1300		

NOTE: THIS OPENING HAS AN EXIT DEVICE WITH FAIL-SAFE, ELECTRIFIED, PULL-SIDE TRIM (E996L) AND A RED SILK-SCREENED LETTERED TOUCHBAR "EMERGENCY EXIT ONLY, PUSH TO OPEN AND SOUND ALARM" (THERE IS NO SS SWITCH). THIS DEVICE MUST BE TIED INTO THE FIRE ALARM FOR ACCESS FROM THE STAIR WELL SIDE. IN THE EVENT OF A FIRE ALARM OR LOSS OF POWER THE OUTSIDE TRIM IS UNLOCKED.

FINISH HARDWARE

HW SET: 23B INTERIOR / RATED / PANIC HARDWARE / EXIT ONLY

DOOR NUMBER:

S24.1 S24.2 S34.1 S34.2

EACH TO HAVE:

3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	FIRE EXIT HARDWARE	99EO-F	626	VON
1	EA	SURFACE CLOSER	4041 EDA	689	LCN
1	EA	FLOOR STOP	FS444	626	IVE
1	SET	GASKET	PER SELECTED DOOR MFGR		
1	EA	THRESHOLD	PER DETAIL	628	

HW SET: 24 INTERIOR / CONCESSION / KEYPAD

DOOR NUMBER:

201.1

EACH TO HAVE:

3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	OFFICE LOCK	ND53TD SPA	626	SCH
1	EA	PERMANENT CORE	20-740 (PRIMUS)	626	SCH
1	EA	MORTISE CYLINDER	20-771 (PRIMUS FOR KEY SWITCH)	626	SCH
1	EA	SURFACE CLOSER	4041 EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	DOME STOP	FS436	626	IVE
3	EA	SILENCER	SR64	GRY	IVE
1	EA	DOOR CONTACT	PROVIDED UNDER DIVISION 28 1300		
1	EA	KEYSWITCH	653-04 L2 (PROVIDED UNDER DIVISION 28 1300630		SCE

NOTE: TIE THE CONTACTS FROM HW SET 13A INTO THIS KEY SWITCH.

HW SET: 25 INTERIOR / CLASSROOM, STERILIZATION

DOOR NUMBER:

220.1

EACH TO HAVE:

3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	CLASSROOM SEC LOCK	ND75RD SPA	626	SCH
1	EA	SURFACE CLOSER	4041 EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	FLOOR STOP & HOLDER	FS40	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 25A INTERIOR / STERILIZATION

DOOR NUMBER:

316.1

EACH TO HAVE:

3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	CLASSROOM LOCK	ND70RD SPA	626	SCH
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	DOME STOP	FS436	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 25B INTERIOR / STERILIZATION, SUPPLY

DOOR NUMBER:

316.2 370.1

EACH TO HAVE:

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	CLASSROOM LOCK	ND70RD SPA	626	SCH
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	DOME STOP	FS436	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 26 INTERIOR / CHANGING

DOOR NUMBER:

220.2

EACH TO HAVE:

3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	PRIVACY SET	ND40S SPA	626	SCH
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	DOME STOP	FS436	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 27 INTERIOR / RECEPTION

DOOR NUMBER:

251.1

EACH TO HAVE:

3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	CLASSROOM LOCK	ND70RD SPA	626	SCH
1	EA	DOME STOP	FS436	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

FINISH HARDWARE

HW SET: 28 INTERIOR / RATED / DISPENSARY
DOOR NUMBER:
270.1

EACH TO HAVE:

3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	OFFICE LOCK	ND53RD SPA	626	SCH
1	EA	SURFACE CLOSER	4041	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	DOME STOP	FS436	626	IVE
1	SET	GASKET	PER SELECTED DOOR MFGR		

HW SET: 29 INTERIOR / CORRIDOR / ALARM
DOOR NUMBER:
206 323.2

EACH TO HAVE:

2	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	ELECTRIC HINGE	5BB1HW 4.5 X 4.5 TW8	652	IVE
1	EA	PANIC HARDWARE	99L X E996L X 17 X FS (FAIL SAFE) (LOCAL ALARM)	626	VON
1	EA	IC RIM CYLINDER	20-057T X ICX (CONST CORE)	626	SCH
1	EA	PERMANENT CORE	20-740 (PRIMUS)	626	SCH
1	EA	RIM CYLINDER	20-757 (PRIMUS IC CORE RIM CYL) FOR EXIT ALARM	613	SCH
1	EA	SURFACE CLOSER	4041 EDA	689	LCN
1	EA	FLOOR STOP	FS444	626	IVE
3	EA	SILENCER	SR64	GRY	IVE
1	EA	POWER SUPPLY	PS873-FA	GRY	VON
1	EA	DOOR CONTACT	PROVIDED UNDER DIVISION 28 1300		
1	EA	LOCAL EXIT ALARM	PROVIDED UNDER DIVISION 28 1300		

NOTE: THIS OPENING HAS AN EXIT DEVICE WITH FAIL-SAFE, ELECTRIFIED, PULL-SIDE TRIM (E996L) AND A RED SILK-SCREENED LETTERED TOUCHBAR "EMERGENCY EXIT ONLY, PUSH TO OPEN AND SOUND ALARM" (THERE IS NO SS SWITCH). THIS DEVICE MUST BE TIED INTO THE FIRE ALARM FOR ACCESS FROM THE STAIR OR CORRIDOR. IN THE EVENT OF A FIRE ALARM OR LOSS OF POWER THE OUTSIDE TRIM IS UNLOCKED.

HW SET: 30 INTERIOR / SPINNING
 DOOR NUMBER:
 253.1

EACH TO HAVE:

3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	PANIC HARDWARE	CD99NL X 990NL	626	VON
1	EA	IC RIM CYLINDER	20-057T X ICX (CONST CORE)	626	SCH
1	EA	MORTISE CYLINDER	20-061T XQ11-948	626	SCH
2	EA	CORE ONLY	23-030 (CLASSIC F)	626	SCH
1	EA	SURFACE CLOSER	4041 EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	FLOOR STOP & HOLDER	FS40	626	IVE
1	EA	SILL	PER DETAIL	628	
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 30A INTERIOR / ALUM STOREFRONT / EXERCISE
 DOOR NUMBER:
 255.1

EACH TO HAVE:

1	EA	CONTINUOUS HINGE	112HD	628	IVE
1	EA	PANIC HARDWARE	CD99NL X 990NL	626	VON
1	EA	IC RIM CYLINDER	20-057T X ICX (CONST CORE)	626	SCH
1	EA	MORTISE CYLINDER	20-061T XQ11-948	626	SCH
2	EA	CORE ONLY	23-030 (CLASSIC F)	626	SCH
1	EA	SURFACE CLOSER	4041 X 79ELR X 18G TOP JAMB/ PUSH SIDE	689	LCN
1	EA	FLOOR STOP & HOLDER	FS40	626	IVE
1	SET	DOOR SEALS	SUPPLY WITH DOOR AND FRAME ASSEMBLY		
1	EA	SILL	PER DETAIL	628	

HW SET: 31 INTERIOR PAIR / YOGA
 DOOR NUMBER:
 257.1 259

EACH TO HAVE:

6	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	PANIC HARDWARE	CD9927DT-LBR	626	VON
1	EA	PANIC HARDWARE	CD9927NL-LBR	626	VON
1	EA	IC RIM CYLINDER	20-057T X ICX (CONST CORE)	626	SCH
2	EA	MORTISE CYLINDER	20-061T XQ11-948	626	SCH
3	EA	CORE ONLY	23-030 (CLASSIC F)	626	SCH
2	EA	SURFACE CLOSER	4041 EDA	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
2	EA	FLOOR STOP & HOLDER	FS40	626	IVE
1	EA	SILL	PER DETAIL	628	

FINISH HARDWARE

HW SET: 32 INTERIOR PAIR / RATED

DOOR NUMBER:

290 390

EACH TO HAVE:

6	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	FIRE EXIT HARDWARE	9927EO-F-LBR	626	VON
1	EA	FIRE EXIT HARDWARE	9927L-F-LBR 996L X 17	626	VON
1	EA	IC RIM CYLINDER	20-057T X ICX (CONST CORE)	626	SCH
1	EA	CORE ONLY	23-030 (CLASSIC F)	626	SCH
2	EA	SURFACE CLOSER	4041 EDA	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
2	EA	FLOOR STOP	FS444	626	IVE
2	EA	MAGNETIC HOLD-OPEN	SEM 7830	AL	LCN
1	SET	GASKET	PER SELECTED DOOR MFGR		
1	EA	SILL	PER DETAIL	628	

HW SET: 33 EXTERIOR PAIR / ALUMINUM STOREFRONT / DOOR CONTACT AND RX ONLY

DOOR NUMBER:

S21.1

EACH TO HAVE:

2	EA	CONTINUOUS HINGE	112HD	628	IVE
1	EA	PANIC HARDWARE	CD9947DT	626	VON
1	EA	PANIC HARDWARE	CD9947NL	626	VON
1	EA	IC RIM CYLINDER	20-057T X ICX (CONST CORE)	626	SCH
1	EA	PERMANENT CORE	20-740 (PRIMUS)	626	SCH
2	EA	MORTISE CYLINDER	20-771 X XQ11-948 (FOR CD DOGGING)	626	SCH
2	EA	SURFACE CLOSER	4041 X 79ELR X 18G TOP JAMB/ PUSH SIDE	689	LCN
2	EA	OVERHEAD STOP	100S	630	GLY
1	SET	WEATHER SEAL	SUPPLY WITH DOOR AND FRAME ASSEMBLY		
2	EA	DOOR SWEEP	SUPPLY WITH DOOR AND FRAME ASSEMBLY		
1	EA	THRESHOLD	PER DETAIL	628	
2	EA	DOOR CONTACT	PROVIDED UNDER DIVISION 28 1300		
1	EA	RX MOTION DETECTOR	PROVIDED UNDER DIVISION 28 1300		

NOTE: THIS IS A MONITORED DOOR WITH AUTHORIZED EXITING.

HW SET: 34 INTERIOR / STAIR

DOOR NUMBER:

S23.3

EACH TO HAVE:

3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	PANIC HARDWARE	99L-BE X 996L-BE X 17	626	VON
1	EA	SURFACE CLOSER	4041 EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	FLOOR STOP	FS444	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 35 INTERIOR PAIR / ALUMINUM STOREFRONT / STUDENT LOUNGE
 DOOR NUMBER:
 323.1

EACH TO HAVE:

2	EA	CONTINUOUS HINGE	112HD	628	IVE
1	EA	PANIC HARDWARE	CD9947DT	626	VON
1	EA	PANIC HARDWARE	CD9947NL	626	VON
1	EA	IC RIM CYLINDER	20-057T X ICX (CONST CORE)	626	SCH
2	EA	MORTISE CYLINDER	20-061T XQ11-948	626	SCH
3	EA	CORE ONLY	23-030 (CLASSIC F)	626	SCH
2	EA	SURFACE CLOSER	4021 X 18G (TOP JAMB MOUNTED)	689	LCN
2	EA	FLOOR STOP	FS444	626	IVE
2	EA	DOOR SWEEP	SUPPLY WITH DOOR AND FRAME ASSEMBLY		
1	EA	THRESHOLD	PER DETAIL	628	

HW SET: 36 EXTERIOR / ALUM STOERFRONT / TERRACE / ACCESS CONTROL
 DOOR NUMBER:
 311

EACH TO HAVE:

1	EA	POWER TRANSFER	EPT-2	689	VON
1	EA	CONTINUOUS HINGE	112HD EPT	628	IVE
1	EA	PERMANENT CORE	20-740 (PRIMUS)	626	SCH
1	EA	EU STOREROOM LOCK	ND80TDEU SPA X RX (N123-062)	626	SCH
1	EA	SURFACE CLOSER	4041 EDA	689	LCN
1	EA	FLOOR STOP	FS444	626	IVE
1	SET	WEATHER SEAL	SUPPLY WITH DOOR AND FRAME ASSEMBLY		
1	EA	DOOR SWEEP	SUPPLY WITH DOOR AND FRAME ASSEMBLY		
1	EA	THRESHOLD	PER DETAIL	628	
1	EA	DOOR CONTACT	PROVIDED UNDER DIVISION 28 1300		
1	EA	POWER SUPPLY	PROVIDED UNDER DIVISION 28 1300		

NOTE: THIS IS A SCHEDULED LOCK AND UNLOCK OPENING. THE RX SWITCH IS BUILT INTO THE LOCKSET FOR IMMEDIATE ACCESS TO THE BUILDING FROM THE TERRACE WITHOUT SETTING OFF ALARM. VERIFY THIS FUNCTION PRIOR TO ORDERING LOCK

FINISH HARDWARE

HW SET: 37 INTERIOR / CORRIDOR / ACCESS CONTROL / CARD READER
DOOR NUMBER:
313.1

EACH TO HAVE:

2	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	ELECTRIC HINGE	5BB1HW 4.5 X 4.5 TW8	652	IVE
1	EA	PANIC HARDWARE	CD99L E996L X 17 X FSE	626	VON
1	EA	IC RIM CYLINDER	20-057T X ICX (CONST CORE)	626	SCH
1	EA	PERMANENT CORE	20-740 (PRIMUS)	626	SCH
1	EA	MORTISE CYLINDER	20-771 X XQ11-948 (FOR CD DOGGING)	626	SCH
1	EA	SURFACE CLOSER	4041 EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	FLOOR STOP	FS444	626	IVE
3	EA	SILENCER	SR64	GRY	IVE
1	EA	CARD READER	PROVIDED UNDER DIVISION 28 1300		
1	EA	DOOR CONTACT	PROVIDED UNDER DIVISION 28 1300		
1	EA	POWER SUPPLY	PROVIDED UNDER DIVISION 28 1300		
1	EA	RX MOTION DETECTOR	PROVIDED UNDER DIVISION 28 1300		

HW SET: 37A INTERIOR / CORRIDOR / ACCESS CONTROL
DOOR NUMBER:
360.1

EACH TO HAVE:

3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	PANIC HARDWARE	99EO (EMERG EXIT ONLY, PUSH TO OPEN SOUND..)	626	VON
1	EA	RIM CYLINDER	20-757 (PRIMUS IC CORE RIM CYL) FOR EXIT ALARM	613	SCH
1	EA	SURFACE CLOSER	4041 EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	FLOOR STOP	FS444	626	IVE
3	EA	SILENCER	SR64	GRY	IVE
1	EA	DOOR CONTACT	PROVIDED UNDER DIVISION 28 1300		
1	EA	LOCAL EXIT ALARM	PROVIDED UNDER DIVISION 28 1300		
1	EA	POWER SUPPLY	PROVIDED UNDER DIVISION 28 1300		

NOTE: THIS IS AN EXIT ONLY DOOR WITH A LOCAL ALARM. THE PANIC DEVICE USES THE RED SILK-SCREENED TOUCHBAR WITH "EMERGENCY EXIT ONLY, PUSH TO OPEN AND SOUND ALARM" BUT IS NOT ELECTRIFIED.

HW SET: 37B INTERIOR PAIR / ACCESS CONTROL / CARD READER

DOOR NUMBER:

360.2 380.1

EACH TO HAVE:

5	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	ELECTRIC HINGE	5BB1HW 4.5 X 4.5 TW8	652	IVE
1	EA	PANIC HARDWARE	9927EO-LBR	626	VON
1	EA	PANIC HARDWARE	CD9927L-LBR X E996L X 17	626	VON
1	EA	IC RIM CYLINDER	20-057T X ICX (CONST CORE)	626	SCH
1	EA	PERMANENT CORE	20-740 (PRIMUS)	626	SCH
1	EA	MORTISE CYLINDER	20-771 X XQ11-948 (FOR CD DOGGING)	626	SCH
2	EA	SURFACE CLOSER	4041 EDA	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
2	EA	FLOOR STOP	FS444	626	IVE
2	EA	MAGNETIC HOLD-OPEN	SEM 7830	AL	LCN
1	EA	CARD READ/KEY PAD	PROVIDED UNDER DIVISION 28 1300		
2	EA	DOOR CONTACT	PROVIDED UNDER DIVISION 28 1300		
1	EA	POWER SUPPLY	PROVIDED UNDER DIVISION 28 1300		
1	EA	RX MOTION DETECTOR	PROVIDED UNDER DIVISION 28 1300		

HW SET: 38 INTERIOR / ALUMINUM SF / ACCESS CONTROL / CARD READER AND KEYPAD

DOOR NUMBER:

313.2

EACH TO HAVE:

1	EA	POWER TRANSFER	EPT-10	689	VON
1	EA	CONTINUOUS HINGE	112HD EPT	628	IVE
1	EA	PANIC HARDWARE	CD99L E996L X 17 X FSE	626	VON
1	EA	IC RIM CYLINDER	20-057T X ICX (CONST CORE)	626	SCH
1	EA	PERMANENT CORE	20-740 (PRIMUS)	626	SCH
1	EA	MORTISE CYLINDER	20-771 X XQ11-948 (FOR CD DOGGING)	626	SCH
1	EA	SURFACE CLOSER	4041 EDA	689	LCN
1	EA	FLOOR STOP	FS444	626	IVE
1	SET	DOOR SEALS	SUPPLY WITH DOOR AND FRAME ASSEMBLY		
1	EA	THRESHOLD	PER DETAIL	628	
1	EA	CARD READ/KEY PAD	PROVIDED UNDER DIVISION 28 1300		
1	EA	DOOR CONTACT	PROVIDED UNDER DIVISION 28 1300		
1	EA	POWER SUPPLY	PROVIDED UNDER DIVISION 28 1300		
1	EA	RX MOTION DETECTOR	PROVIDED UNDER DIVISION 28 1300		

NOTE: THIS OPENING HAS ELECTRIFIED TRIM, CARD READER / KEYPAD

FINISH HARDWARE

HW SET: 39 INTERIOR / RADIOLOGY / ACCESS CONTROL / CARD READER
DOOR NUMBER:
305

EACH TO HAVE:

2	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	ELECTRIC HINGE	5BB1HW 4.5 X 4.5 TW4	652	IVE
1	EA	PERMANENT CORE	20-740 (PRIMUS)	626	SCH
1	EA	EU STOREROOM LOCK	ND80TDEU SPA	626	SCH
1	EA	SURFACE CLOSER	4041	689	LCN
1	EA	DOME STOP	FS436	626	IVE
1	EA	THRESHOLD	PER DETAIL	628	
1	EA	CARD READER	PROVIDED UNDER DIVISION 28 1300		
1	EA	DOOR CONTACT	PROVIDED UNDER DIVISION 28 1300		
1	EA	POWER SUPPLY	PROVIDED UNDER DIVISION 28 1300		
1	EA	RX MOTION DETECTOR	PROVIDED UNDER DIVISION 28 1300		

HW SET: 40 INTERIOR / SGL STALL RESTROOM
DOOR NUMBER:
342

EACH TO HAVE:

3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	PRIVACY SET	ND40S SPA	626	SCH
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	WALL STOP	WS402CCV	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 41 INTERIOR / RATED / CLASSROOM
DOOR NUMBER:
352.1 354.2

EACH TO HAVE:

3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	FIRE EXIT HARDWARE	99L-F 996L X 17	626	VON
1	EA	IC RIM CYLINDER	20-057T X ICX (CONST CORE)	626	SCH
1	EA	CORE ONLY	23-030 (CLASSIC F)	626	SCH
1	EA	SURFACE CLOSER	4041 EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	FLOOR STOP	FS444	626	IVE
1	EA	MAGNETIC HOLD-OPEN	SEM 7830	AL	LCN
1	SET	GASKET	PER SELECTED DOOR MFGR		
1	EA	THRESHOLD	PER DETAIL	628	

HW SET: 41A INTERIOR / RATED / CLASSROOM

DOOR NUMBER:

352.2 354.1

EACH TO HAVE:

3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	FIRE EXIT HARDWARE	99L-F 996L X 17	626	VON
1	EA	IC RIM CYLINDER	20-057T X ICX (CONST CORE)	626	SCH
1	EA	CORE ONLY	23-030 (CLASSIC F)	626	SCH
1	EA	SURFACE CLOSER	4041 SCUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	SET	GASKET	PER SELECTED DOOR MFGR		
1	EA	THRESHOLD	PER DETAIL	628	

HW SET: 42 INTERIOR / SLIDING GLASS DOORS

DOOR NUMBER:

360C.1 360C.2 360D.1 360E.1 360E.2 370C.1
 370C.2 370D.1 370D.2 380C.1 380C.3 380D.1
 380E.1 380E.2

EACH TO HAVE:

1 SET HARDWARE BY DOOR MFG

HW SET: 43 INTERIOR / CONTROL

DOOR NUMBER:

360.3 380.4

EACH TO HAVE:

4	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	CLASSROOM LOCK	ND70RD SPA	626	SCH
1	EA	DOME STOP	FS436	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

- END OF SECTION -

- SECTION 08 8000 -

GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
 - 1. Windows.
 - 2. Doors.
 - 3. Glazed curtain walls.
 - 4. Glazed entrances.
 - 5. Interior borrowed lites.
 - 6. Storefront framing.
 - 7. Spandrel glazing.
 - 8. Decorative film overlay.

1.3 RELATED SECTIONS

- A. Section 01 74 19 "Materials Recycling & Waste Management".
- B. Section 01 81 13 "LEED Certification Requirements".
- C. Section 07 4215 "Glass Façade Panel System".
- D. Section 08 1113 "Hollow Metal Doors & Frames" for vision panels in metal doors.
- E. Section 08 1416 "Flush Wood Doors" for vision panels in wood doors.
- F. Section 08 1613 "FRP Flush Doors" for vision panels in FRP doors.
- G. Section 08 4113 "Aluminum Framed Entrances & Storefronts".

1.4 DEFINITIONS

- A. Manufacturers of Glass Products: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.
- C. Interspace: Space between lites of an insulating-glass unit that contains dehydrated air or a specified gas.
- D. Deterioration of Coated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in metallic coating.
- E. Deterioration of Insulating Glass: Failure of hermetic seal under normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.
- F. Deterioration of Laminated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1.5 PERFORMANCE REQUIREMENTS

- A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Glass Design: Glass thickness designations indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites in the thickness designations indicated for various size openings, but not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:
 - 1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300, according to the following requirements:
 - a. Specified Design Wind Loads: As indicated on structural drawings, but not less than wind loads applicable to Project as required by ASCE 7 "Minimum Design Loads for Buildings and Other Structures": Section 6.0 "Wind Loads."
 - b. Probability of Breakage for Vertical Glazing: 8 lites per 1000 for lites set vertically or not more than 15 degrees off vertical and under wind action.
 - 1) Load Duration: 3 seconds.

- c. Maximum Lateral Deflection: For the following types of glass supported on all 4 edges, provide thickness required that limits center deflection at design wind pressure to 1/50 times the short side length or 1 inch (25 mm), whichever is less.
 - 1) For monolithic-glass lites heat treated to resist wind loads.
 - 2) For insulating glass.
 - 3) For laminated-glass lites.
 - d. Minimum Glass Thickness for Exterior Lites: Not less than 6.0 mm.
 - e. Thickness of Tinted and Heat-Absorbing Glass: Provide the same thickness for each tint color indicated throughout Project.
- C. Thermal Movements: Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
- 1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- D. Thermal and Optical Performance Properties: Provide glass with performance properties specified based on manufacturer's published test data, as determined according to procedures indicated below:
- 1. For monolithic-glass lites, properties are based on units with lites 6.0 mm thick.
 - 2. For laminated-glass lites, properties are based on products of construction indicated.
 - 3. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
 - 4. Center-of-Glass Values: Based on using LBL-44789 WINDOW 5.0 computer program for the following methodologies:
 - a. U-Factors: NFRC 100 expressed as Btu/ sq. ft. x h x deg F (W/sq. m x K).
 - b. Solar Heat Gain Coefficient: NFRC 200.
 - c. Solar Optical Properties: NFRC 300.

1.6 SUBMITTALS

- A. Product Data: For each glass product and glazing material indicated.
- B. LEED Submittal: See Section 018113 LEED Certification Requirements for the following:
 - 1. MRc4 Recycled Content: Product data for products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content.
 - a. Include cost information for each product having recycled content.
 - 2. MRc5 Regional Materials:
 - a. Sourcing location(s): indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery from the project site.
 - b. Manufacturing location(s): indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
 - c. Product Value: indicate dollar value of product containing regional materials; include materials costs only.

- d. Product Component(s) Value: Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.
3. EQc4.1 Adhesives & Sealants: Product data for adhesives & sealants, including printed statement of VOC content and chemical components.
- C. Samples: For the following products, in the form of 12-inch- (300-mm-) square Samples for glass and of 12-inch- (300-mm-) long Samples for sealants. Install sealant Samples between two strips of material representative in color of the adjoining framing system.
 1. Each color of tinted float glass.
 2. Ceramic-coated spandrel glass.
 3. Each pattern and color of ceramic-coated vision glass.
 4. Fire-resistive glazing products.
 5. Insulating glass for each designation indicated.
 6. For each color (except black) of exposed glazing sealant indicated.
 7. Each decorative film overlay on type of decorative glass.
- D. Glazing Schedule: Use same designations indicated on Drawings for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.
- E. Product Certificates: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.
 1. For solar-control low-e-coated glass, provide documentation demonstrating that manufacturer of coated glass is certified by coating manufacturer.
- F. Preconstruction Adhesion and Compatibility Test Report: From glazing sealant manufacturer indicating glazing sealants were tested for adhesion to glass and glazing channel substrates and for compatibility with glass and other glazing materials.
- G. Product Test Reports: For each of the following types of glazing products:
 1. Tinted float glass.
 2. Coated float glass.
 3. Insulating glass.
 4. Glazing sealants.
 5. Glazing gaskets.
- H. Warranties: Special warranties specified in this Section.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in glass installations with a record of successful in-service performance; and who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

- B. Source Limitations for Glass: Obtain the following through one source from a single manufacturer for each glass type: clear float glass, coated float glass, laminated glass and insulating glass.
- C. Source Limitations for Glass Sputter-Coated with Solar-Control Low-E Coatings: Where solar-control low-e coatings of a primary glass manufacturer that has established a certified fabricator program is specified, obtain sputter-coated solar-control low-e-coated glass in fabricated units from a manufacturer that is certified by coated-glass manufacturer.
- D. Source Limitations for Glazing Accessories: Obtain glazing accessories through one source from a single manufacturer for each product and installation method indicated.
- E. Glass Product Testing: Obtain glass test results for product test reports in "Submittals" Article from a qualified testing agency based on testing glass products.
1. Glass Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.
- F. Elastomeric Glazing Sealant Product Testing: Obtain sealant test results for product test reports in "Submittals" Article from a qualified testing agency based on testing current sealant formulations within a 36-month period.
1. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated, as documented according to ASTM E 548.
 2. Test elastomeric glazing sealants for compliance with requirements specified by reference to ASTM C 920, and where applicable, to other standard test methods.
- G. Glazing for Fire-Rated Door Assemblies: Glazing for assemblies that comply with NFPA 80 and that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 252.
- H. Glazing for Fire-Rated Window Assemblies: Glazing for assemblies that comply with NFPA 80 and that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 257.
- I. Safety Glazing Products: Comply with testing requirements in 16 CFR 1201.
1. Subject to compliance with requirements, obtain safety glazing products permanently marked with certification label of the Safety Glazing Certification Council or another certification agency or manufacturer acceptable to authorities having jurisdiction.
 2. Where glazing units, including Kind FT glass and laminated glass, are specified in Part 2 articles for glazing lites more than **9 sq. ft. (0.84 sq. m)** in exposed surface area of one side, provide glazing products that comply with Category II materials, for lites **9 sq. ft. (0.84 sq. m)** or less in exposed surface area of one side, provide glazing products that comply with Category I or II materials, except for hazardous locations where Category II materials are required by 16 CFR 1201 and regulations of authorities having jurisdiction.
- J. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
1. GANA Publications: GANA Laminated Division's "Laminated Glass Design Guide" and GANA's "Glazing Manual."

2. AAMA Publications: AAMA GDSG-1, "Glass Design for Sloped Glazing," and AAMA TIR-A7, "Sloped Glazing Guidelines."
 3. IGMA Publication for Sloped Glazing: IGMA TB-3001, "Sloped Glazing Guidelines."
 4. IGMA Publication for Insulating Glass: SIGMA TM-3000, "Glazing Guidelines for Sealed Insulating Glass Units."
- K. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the following testing and inspecting agency:
1. Insulating Glass Certification Council.
 2. Associated Laboratories, Inc.
- L. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- B. For insulating-glass units that will be exposed to substantial altitude changes, comply with insulating-glass manufacturer's written recommendations for venting and sealing to avoid hermetic seal ruptures.

1.9 PROJECT CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
 1. Do not install liquid glazing sealants when ambient and substrate temperature conditions are outside limits permitted by glazing sealant manufacturer or below 40 deg F (4.4 deg C).

1.10 WARRANTY

- A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form, made out to Owner and signed by coated-glass manufacturer agreeing to replace coated-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
 1. Warranty Period: 10 years from date of Substantial Completion.
- B. Manufacturer's Special Warranty on Laminated Glass: Manufacturer's standard form, made out to Owner and signed by laminated-glass manufacturer agreeing to replace laminated-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
 1. Warranty Period: Five years from date of Substantial Completion.

- C. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form, made out to Owner and signed by insulating-glass manufacturer agreeing to replace insulating-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
1. Basis-of-Design Product: The design for each glazing product is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers specified.

2.2 GLASS PRODUCTS

- A. Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I (clear) unless otherwise indicated.
- B. Ultraclear Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I, complying with other requirements specified and with visible light transmission not less than 91 percent.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. AFG Industries, Inc.; Krystal Klear.
 - b. Guardian Industries Corp.; Ultrawhite.
 - c. Pilkington North America; Optiwhite.
 - d. PPG Industries, Inc.; Starphire.
- C. Heat-Treated Float Glass: ASTM C 1048; Type I (transparent flat glass); Quality-Q3; of class, kind, and condition indicated.
1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed, unless otherwise indicated.
 2. Provide Kind HS (heat-strengthened) float glass in place of annealed float glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in Part 1 "Performance Requirements" Article.
 3. For uncoated glass, comply with requirements for Condition A.
 4. For coated vision glass, comply with requirements for Condition C (other uncoated glass).
 5. Provide Kind FT (fully tempered) float glass in place of annealed or Kind HS (heat-strengthened) float glass where safety glass is indicated.
- D. Ceramic-Coated Vision Glass: Float glass with ceramic enamel applied by silk-screened process and complying with ASTM C 1048, Condition C (other coated glass), Type I (transparent flat glass), Quality-Q3, Specification No. 95-1-31 in GANA Tempering Division's "Engineering Standards Manual," and other requirements specified.

- E. Ceramic-Coated Spandrel Glass: ASTM C 1048, Condition B (spandrel glass, one surface ceramic coated), Type I (transparent flat glass), Quality-Q3, and complying with other requirements specified.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide ceramic-coated spandrel glass by Northwestern Industries or comparable product by one of the following:
 - a. Oldcastle Glass, Inc
 - b. Viracon.
 - 2. Glass: Clear float.
 - 3. Ceramic Coating Color: White.
 - 4. Fallout Resistance: Provide spandrel units identical to those passing the fallout-resistance test for spandrel glass specified in ASTM C 1048.

- F. Sputter-Coated Float Glass: ASTM C 1376, float glass with metallic-oxide or -nitride coating deposited by vacuum deposition process after manufacture and heat treatment (if any), and complying with other requirements specified.

- G. Laminated Glass: ASTM C 1172, and complying with other requirements specified and with the following:
 - 1. Interlayer: Polyvinyl butyral of thickness indicated with a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after laminating glass lites and installation.
 - a. For polyvinyl butyral interlayers, laminate lites in autoclave with heat plus pressure.
 - 2. Laminating Process: Fabricate laminated glass to produce glass free of foreign substances and air or glass pockets.

- H. Insulating-Glass Units, General: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, and complying with ASTM E 774 for Class CBA units and with requirements specified in this Article and in Part 2 "Insulating-Glass Units" Article.
 - 1. Provide Kind HS (heat-strengthened) float glass in place of annealed glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in Part 1 "Performance Requirements" Article.
 - 2. Provide Kind FT (fully tempered) glass lites where safety glass is indicated.
 - 3. Overall Unit Thickness and Thickness of Each Lite: Dimensions indicated for insulating-glass units are nominal and the overall thicknesses of units are measured perpendicularly from outer surfaces of glass lites at unit's edge.
 - 4. Sealing System: Dual seal, with primary and secondary sealants as follows:
 - a. Manufacturer's standard sealants.
 - 5. Spacer Specifications: Manufacturer's standard spacer material and construction complying with the following requirements:
 - a. Spacer Material: Warm Edge; aluminum with mill or clear anodic finish
 - 1) Stainless steel if required based on size of unit

2.3 DECORATIVE FILM OVERLAY

- A. Cast PVC Film: Translucent, dimensionally stable cast PVC film, 2-mil- (0.05-mm-) minimum thickness, with pressure-sensitive clear adhesive back for adhering to glass and releasable protective backing.
1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited, to the following:
 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Avery Dennison Graphics Division; Etchmark A5861-S.
 - b. FDC Graphic Films, Inc.; Series 2100/2200, 007 Frosted Silver Metallic.
 - c. Spar-Cal Division, Spartan International; Etchlight.
 - d. 3M Commercial Graphics Division; Scotchcal Dusted Crystal.
 3. Use: Exterior applications.
 4. Colors: TBD
- B. Outdoor Durability: Not less than five years.

2.4 GLAZING GASKETS (DRY)

- A. Dense Compression Gaskets: Molded or extruded gaskets of material indicated below, complying with standards referenced with name of elastomer indicated below, and of profile and hardness required to maintain watertight seal:
1. Neoprene, ASTM C 864.
 2. EPDM, ASTM C 864.
 3. Silicone, ASTM C 1115.
 4. Thermoplastic polyolefin rubber, ASTM C 1115.
 5. Any material indicated above as recommended by manufacture.
- B. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned gaskets of material indicated below; complying with ASTM C 509, Type II, black; and of profile and hardness required to maintain watertight seal:
1. Neoprene.
 2. EPDM.
 3. Silicone.
 4. Thermoplastic polyolefin rubber.
 5. Any material indicated above as recommended by manufacture.
- C. Lock-Strip Gaskets: Neoprene extrusions in size and shape indicated, fabricated into frames with molded corner units and zipper lock-strips, complying with ASTM C 542, black.

2.5 GLAZING SEALANTS (WET)

- A. General: Provide products of type indicated, complying with the following requirements:
1. Compatibility: Select glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
 3. VOC Content: For sealants used inside of the weatherproofing system, not more than 250 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 4. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.
- B. Elastomeric Glazing Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
1. Single-Component Neutral-Curing Silicone Glazing Sealants GS-1:
 - a. Available Products:
 - 1) GE Silicones; SilPruf SCS2000.
 - 2) Pecora Corporation; 864.
 - 3) Pecora Corporation; 890.
 - 4) Polymeric Systems Inc.; PSI-641.
 - 5) Sonneborn, Div. of ChemRex, Inc.; Omniseal.
 - 6) Tremco; Spectrem 3.
 - b. Type and Grade: S (single component) and NS (nonsag).
 - c. Class: 50.
 - d. Use Related to Exposure: NT (nontraffic).
 - e. Uses Related to Glazing Substrates: M, G, A, and, as applicable to glazing substrates indicated, O.
 - 1) Use O Glazing Substrates: Coated glass color anodic aluminum aluminum coated with a high-performance coating galvanized steel and wood.
 - f. Applications: Vertical glazing applications as recommended by manufacture where wet seal is preferred over gaskets.
- C. Glazing Sealants for Fire-Resistive Glazing Products: Identical to products used in test assemblies to obtain fire-protection rating.

2.6 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based elastomeric tape with a solids content of 100 percent; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; packaged on rolls with a release paper backing; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
1. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
 2. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.
- B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; packaged on rolls with release liner protecting adhesive; and complying with AAMA 800 for the following types:

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1. Type 1, for glazing applications in which tape acts as the primary sealant.
2. Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.7 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions with a Shore, Type A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- F. Perimeter Insulation for Fire-Resistive Glazing: Identical to product used in test assembly to obtain fire-resistance rating.

2.8 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
- B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites in a manner that produces square edges with slight kerfs at junctions with outdoor and indoor faces.
- C. Grind smooth and polish glass edges and corners, where exposed.

2.9 MONOLITHIC FLOAT-GLASS UNITS

- A. Uncoated Clear Float-Glass Units:
 1. Class 1 (clear) annealed or Kind HS (heat-strengthened) float glass where heat strengthening is required to resist thermal stresses induced by differential shading of individual glass lites and to comply with system performance requirements
 - a. Kind FT (fully tempered) float glass as indicated on drawings.
 - b. Thickness: 6.0 mm.
- B. Glass Type (**GL3**): Ceramic-coated spandrel glass, fully tempered float glass.
 1. Thickness: 6.0 mm.
 2. Coating Location: Second surface.

2.10 FIRE-RATED GLAZING PRODUCTS

- A. Laminated Ceramic Glazing Material: Proprietary Category II safety glazing product in the form of 2 lites of clear ceramic glazing material laminated together to produce a laminated lite of **5/16-inch (8-mm)** nominal thickness; polished on both surfaces; weighing **4 lb/sq. ft. (19.5 kg/sq. m)**; and as follows:
1. Fire-Protection Rating: As indicated for the assembly in which glazing material is installed, and permanently labeled by a testing and inspecting agency acceptable to authorities having jurisdiction.
 - a. Polished on both surfaces, transparent.
 - b. Product: "FireLite Plus" by Nippon Electric Glass Co., Ltd., and distributed by Technical Glass Products.
 - 1) Overall Unit Thickness: 28.6 mm.
 - 2) Interspace Content: Air, 1/2-inch (13.2 mm)

2.11 INSULATING-GLASS UNITS

- A. Solar-Control Low-E Insulating-Glass Units (**GL2A and GL2B**):
1. Basis-of-Design Product: Viracon Solarscreen VE1-2M, or equal, clear outer lite with Low E. Spectrally Selective-Sputter Coating or a comparable product by one of the following:
 - a. AFG Industries
 - b. Cardinal
 - c. Guardian Industries
 - d. PPG
 2. Overall Unit Thickness and Thickness of Each Lite: 1-inch.
 3. Interspace Content: Air with 1/2 thick spacer.
 4. Outdoor Lite: Class 1 (clear) float glass.
 - a. Kind HS (Heat Strengthened).
 - b. Low-E Coating: Sputtered on second surface.
 5. Indoor Lite: Class 1 (clear) float glass.
 6. Visible Light Transmittance: 70 percent minimum.
 7. Winter Nighttime U-Factor: 0.29 maximum.
 8. Summer Daytime U-Factor: 0.26 maximum.
 9. Solar Heat Gain Coefficient: 0.38 maximum.
 10. Outdoor Visible Reflectance: 11 percent maximum.
- B. Solar-Control Low-E Insulating-Glass Units (**GL2C**):
1. Basis-of-Design Product: Viracon Solarscreen VE1-2M, or equal, clear outer lite with Low E. Spectrally Selective-Sputter Coating or a comparable product by one of the following:
 - a. AFG Industries
 - b. Cardinal
 - c. Guardian Industries
 - d. PPG
 2. Overall Unit Thickness and Thickness of Each Lite: 1-inch.

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3. Interspace Content: Air with 1/2 thick spacer, color: black.
4. Outdoor Lite: Class 1 (clear) float glass.
 - a. Kind HS (Heat Strengthened).
 - b. Low-E Coating: Sputtered on second surface.
5. Indoor Lite: Class 1 (clear) float glass.
6. Acid Etched: SF101 #3.
7. Visible Light Transmittance: 51 percent minimum.
8. Winter Nighttime U-Factor: 0.30 maximum.
9. Summer Daytime U-Factor: 0.26 maximum.
10. Solar Heat Gain Coefficient: 0.37 maximum.
11. Outdoor Visible Reflectance: 10 percent maximum.

C. Glass Type (**GL2D**): Ceramic-coated, low-e, insulating spandrel glass.

1. Overall Unit Thickness: **1 inch (25 mm)**.
2. Thickness of Each Glass Lite: **6.0 mm**.
3. Outdoor Lite: **Fully tempered float glass**.
4. Interspace Content: **Air**.
5. Indoor Lite: **Fully tempered float glass**.
6. Low-E Coating: **Sputtered on second surface**.
7. Opaque Coating Location: Fourth surface. Custom Color: VC1594
8. Winter Nighttime U-Factor: 0.29 maximum.
9. Summer Daytime U-Factor: 0.26 maximum

2.12 LAMINATED-GLASS TYPES

- A. Glass Type (**GL3S**): Ceramic-coated, laminated vision glass with two plies of fully tempered float glass.
1. Thickness of Each Glass Ply: 6.0 mm.
 2. Interlayer Thickness: 0.060 inch (1.52 mm).
 3. Coating Location: Fourth surface.
 4. Winter Nighttime U-Factor: 0.97 Btu.
 5. Summer Daytime U-Factor: 0.87 Btu.
 6. Provide safety glazing labeling.

2.13 DECORATIVE FILM FABRICATION

- A. Cast PVC Film: Apply squarely aligned to glass edges, uniformly smooth, and free from tears, air bubbles, wrinkles, and rough edges, in single sheet completely overlaying the back face of clean glass, according to manufacturer's written instructions, including surface preparation and application temperature limitations.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine framing glazing, with Installer present, for compliance with the following:
 - 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
 - 2. Presence and functioning of weep system.
 - 3. Minimum required face or edge clearances.
 - 4. Effective sealing between joints of glass-framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.
- C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
- D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.
- E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- G. Provide spacers for glass lites where length plus width is larger than **50 inches (1270 mm)** as follows:
 - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.

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2. Provide **1/8-inch (3-mm)** minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Do not remove release paper from tape until just before each glazing unit is installed.
- F. Apply heel bead of elastomeric sealant.
- G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
- H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 GASKET GLAZING (DRY)

- A. Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

- C. Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. Install gaskets so they protrude past face of glazing stops.

3.6 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.7 LOCK-STRIP GASKET GLAZING

- A. Comply with ASTM C 716 and gasket manufacturer's written instructions. Provide supplementary wet seal and weep system, unless otherwise indicated.

3.8 CLEANING AND PROTECTION

- A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended by glass manufacturer.
- C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.
- D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.
- E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

- END OF SECTION -

- SECTION 08 8300 -

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. Unframed tempered glass mirrors qualifying as safety glazing in restrooms and fitness room.

1.3 RELATED DOCUMENTS

- A. Section 01 74 19 "Materials Recycling & Waste Management".
- B. Section 01 81 13 "LEED Certification Requirements".
- C. Section 08 8000 "Glazing" for glass with reflective coatings used for vision and spandrel lites.
- D. Section 10 2800 "Toilet and Bath Accessories" for metal-framed mirrors.

1.4 DEFINITIONS

- A. Deterioration of Mirrors: Defects developed from normal use that are attributable to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning mirrors contrary to mirror manufacturer's written instructions. Defects include discoloration, black spots, and clouding of the silver film.

1.5 PERFORMANCE REQUIREMENTS

- A. Provide mirrors that will not fail under normal usage. Failure includes glass breakage and deterioration attributable to defective manufacture, fabrication, and installation.

1.6 SUBMITTALS

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

2. Mirror mastic.
 3. Mirror hardware.
- B. LEED Submittal: See Section 018113 LEED Certification Requirements for the following:
1. MRc4 Recycled Content: Product data for products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content.
 - a. Include cost information for each product having recycled content.
 2. MRc5 Regional Materials:
 - a. Sourcing location(s): indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery from the project site.
 - b. Manufacturing location(s): indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
 - c. Product Value: indicate dollar value of product containing regional materials; include materials costs only.
 - d. Product Component(s) Value: Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.
 3. EQc4.1 Adhesives & Sealants: Product data for adhesives & sealants, including printed statement of VOC content and chemical components.
- C. Shop Drawings: Include mirror elevations, edge details, mirror hardware, and attachments to other work.
- D. Samples: For each type of mirror product required, in the form indicated below:
1. Mirrors, 12 inches (300 mm) square, including edge treatment on 2 adjoining edges.
 2. Mirror trim, 12 inches (300 mm) long.
- E. Mirror Mastic Compatibility Test Reports: From mirror manufacturer indicating that mirror mastic was tested for compatibility and adhesion with mirror backing and substrates on which mirrors are installed.
- F. Warranty: Special warranty specified in this Section.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed mirror glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in mirror installations with a record of successful in-service performance; and who employs glass installers for this Project who are certified under NGA's Glazier Certification Program as Level 2 (Senior Glaziers) or Level 3 (Master Glaziers).
- B. Source Limitations for Mirrors: Obtain mirrors from one source for each type of mirror indicated.
- C. Source Limitations for Mirror Glazing Accessories: Obtain mirror glazing accessories from one source for each type of accessory indicated.
- D. Glazing Publications: Comply with the following published recommendations:

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1. GANA's "Glazing Manual" unless more stringent requirements are indicated. Refer to this publication for definitions of glass and glazing terms not otherwise defined in this Section or in referenced standards.
 2. GANA Mirror Division's "Mirrors, Handle with Extreme Care: Tips for the Professional on the Care and Handling of Mirrors."
- E. Safety Glazing Products: For laminated mirrors, provide products complying with testing requirements in 16 CFR 1201 for Category II materials.
- F. Preconstruction Mirror Mastic Compatibility Test: Submit mirror mastic products to mirror manufacturer for testing to determine compatibility of mastic with mirror backing paint and substrates on which mirrors are installed.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Protect mirrors according to mirror manufacturer's written instructions and as needed to prevent damage to mirrors from 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, protected from moisture including condensation.

1.9 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install mirrors until ambient temperature and humidity conditions are maintained at levels indicated for final occupancy.

1.10 WARRANTY

- A. Special Warranty: Manufacturer's standard form, made out to Owner and signed by mirror manufacturer agreeing to replace mirrors that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below:
1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering mirrors that may be incorporated into the Work include, but are not limited to, the following:
1. Arch Aluminum & Glass Co., Inc.
 2. Gardner Glass Products.
 3. Gilded Mirrors, Inc.
 4. Guardian Industries Corp.
 5. Lenoir Mirror Company.
 6. Messer Industries, Inc.

7. Stroupe Mirror Co., Inc.
8. Sunshine Mirror.
9. Virginia Mirror Company, Inc.
10. VVP America, Inc.; Binswanger Mirror Products.

2.2 SILVERED FLAT GLASS MIRROR MATERIALS

- A. Tempered Clear Glass Mirrors: Comply with ASTM C 1503, Mirror Glazing Quality, for blemish requirements in annealed float glass before silver coating is applied, for coating requirements, and with other requirements not affected by tempering process; and comply with ASTM C 1048 for Kind FT, Condition A, tempered float glass before silver coating is applied.
1. Provide mirrors, free from objectionable wave, with safety glass backing complying with CFR Part 1201, Category II and ANSI Z97.1 glazing standards for mirrors extending to within 6-inches of floor, as indicated on Drawings.
 2. Nominal Thickness: 6.0 mm.
 3. Edges: Square and polished.
 4. Reflective Coating: Manufacturer's standard silver coating followed by electrolytic deposited copper coating and 2 separate coats of protective paint.

2.3 MISCELLANEOUS MATERIALS

- A. Setting Blocks: Elastomeric material with a Type A Shore 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, produced specifically for setting mirrors and certified by both mirror manufacturer and mastic manufacturer as compatible with glass coating and substrates on which mirrors will be installed.
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Gunther Mirror Mastics.
 - b. Palmer Products Corporation.
 - c. Pecora Corporation
 2. Primers/Sealers: Types recommended by adhesive manufacturer as required.
 3. VOC Content: Not more than 100 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.4 MIRROR HARDWARE

- A. Top and Bottom Aluminum J-Channels: Aluminum extrusions with a return deep enough to produce a glazing channel to accommodate mirrors of thickness indicated and in lengths required to cover bottom and top edges of each mirror in a single piece.
1. Bottom Trim: J-channels formed with front leg and back leg not less than 5/16 and 3/4 inch (7.9 and 19 mm) in height, respectively.

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2. Top Trim: Formed with front leg with a height of 5/16 inch (7.9 mm) and back leg designed to fit into the pocket created by wall-mounted aluminum cleat.
3. Product: Subject to compliance with requirements, provide the following:
 - a. Bottom Trim: C. R. Laurence Co., Inc.; D638 FHA Type "J" Channel.
 - b. Top Trim: C. R. Laurence Co., Inc.; D 1638 Top Channel.
 - c. Cleat: C. R. Laurence Co., Inc.; D 1637M Mirror Mount System Cleat.
- B. Fasteners: Fabricated of same basic metal and alloy as fastened metal and matching it in finished color and texture where fasteners are exposed.
- C. Anchors and Inserts: Provide 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. Mirror Sizes: To suit Project conditions, and before tempering, cut mirrors to final sizes and shapes.
- B. Cutouts: Fabricate cutouts before tempering for notches and holes in mirrors without marring visible surfaces. Locate and size cutouts so they fit closely around penetrations in mirrors.

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.
 1. Verify compatibility with and suitability of substrates, including compatibility of mirror mastic with existing finishes or primers.
 2. Proceed with mirror 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 surfaces 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.
- B. Provide a minimum air space of 1/8 inch (3 mm) between back of mirrors and mounting surface for air circulation between back of mirrors and face of mounting surface.

- C. For wall-mounted mirrors, install mirrors with mastic and mirror hardware.
 - 1. 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.
 - 2. For mirror hardware in the form of continuous J-channels at bottom, provide setting blocks 1/8 inch (3 mm) thick by 4 inches (100 mm) long at quarter points. To prevent trapping water, provide, between setting blocks, 2 slotted weeps not less than 1/4 inch (6.4 mm) wide by 3/8 inch (9.5 mm) long.
 - 3. For mirror hardware in the form of a continuous J-channel at bottom and continuous top trim at top, fasten J-channel directly to wall and attach top trim to continuous cleat fastened directly to wall.
 - 4. 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 air space of 1/8 inch (3 mm) 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 will prevent mirrors from being exposed to moisture from condensation or other sources for continuous periods of time
- D. Remove labels after Work is completed.
- E. Clean, wash and polish surfaces following manufacturer's recommendations

- END OF SECTION -

DIVISION 09 – FINISHES

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- SECTION 09 2070 -**METAL LATH AND ACCESSORIES**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. This Section describes the requirements for furnishing and installing metal lath and accessories.

1.3 RELATED SECTIONS

- A. Section 01 74 19 "Materials Recycling & Waste Management".
- B. Section 01 81 13 "LEED Certification Requirements".
- C. Section 06 1600 "Sheathing" for sheathing and underlayment.
- D. Section 09 4200 "Portland Cement Plastering" for three coat plaster system.

1.4 QUALITY ASSURANCE

- A. Perform work in accordance with the applicable requirements of California Building Code (CBC) Section 2506.
- B. Industry Association Recommendations: Conform to recommendations of ANSI/MLSFA A42.3, except where those recommendations conflict with specified requirements.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver products and materials in original unopened packages, containers, or bundles with manufacturer's label intact and legible.
- B. Remove items delivered in broken, damaged, rusted, or unlabeled condition from Project site immediately.
- C. Protect metal lath and accessories from moisture and other sources of damage.
- D. Store metallic materials and accessories indoors, off the floor.

1.6 SUBMITTALS

- A. LEED Submittal: See Section 018113 LEED Certification Requirements for the following:
1. MRc5 Regional Materials:
 - a. Sourcing location(s): indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery from the project site.
 - b. Manufacturing location(s): indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
 - c. Product Value: indicate dollar value of product containing regional materials; include materials costs only.
 - d. Product Component(s) Value: Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.
 2. EQc4.1 Adhesives & Sealants: Product data for adhesives & sealants, including printed statement of VOC content and chemical components.
 3. EQc4.2 Paints & Coatings: Product data for paints & coatings, including printed statement of VOC content and chemical components.

PART 2 - PRODUCTS

2.1 LATH

- A. Metal Lath: Steel, coated with rust-inhibitive paint after cutting, or cut from zinc-coated steel sheets.
1. Self-Furring Diamond Mesh: 3.4-pounds per square yard self-furring diamond mesh with evenly spaced indentations to hold lath approximately 1/4-inch away from solid surfaces. Use over solid backing.
 2. 3/8-Inch Rib Lath: 3.4-pounds per square yard, fabricated in herringbone mesh pattern with 3/8-inch deep ribs. Use at horizontal surfaces of suspended soffits and ceilings.

2.2 FASTENERS

- A. Screws:
1. General: ASTM C646, corrosion resistant, for attachment to metal framing 25-gauge and lighter; ASTM C954 for attachment to metal framing 20-gauge and heavier.
 2. Thread and head designs and lengths as recommended by manufacturer for uses and materials involved.

2.3 METAL ACCESSORIES

- A. General: Minimum 26-gauge galvanized steel or zinc alloy, perforated or expanded flanges as manufactured by USG, Western Metal Lath, Keene or approved equal.
1. Foundation Weep Scream: Fabricated from hot-dip galvanized-steel sheet, ASTM A 653/A 653M, G60 (Z180) zinc coating.

METAL LATH AND ACCESSORIES

2. Corner Beads: Small-nose type.
3. Casing Beads: No. 66 square edge.
4. Corner Reinforcement: Cornerite, minimum 1.75-pounds per square yard expanded metal lath with minimum 2-inch legs.
5. Strip Reinforcement: For reinforcing joints of dissimilar materials and diagonal reinforcement at opening corners, minimum 1.75-pounds per square yard expanded metal lath.
6. Control Joints: Keene No. 40 unless special shapes are detailed.
7. Expansion Joints: Fabricated from zinc or zinc-coated (galvanized) steel; folded pair of unperforated screeds in M-shaped configuration; with expanded flanges.
8. Two-Piece Expansion Joints: Fabricated from zinc or zinc-coated (galvanized) steel; formed to produce slip-joint and square-edged reveal that is adjustable from 1/4 to 5/8 inch (6.34 to 16 mm) wide; with perforated flanges.
9. Soffit Vents: To be selected by the Architect.

2.4 UNDERLAYMENT

- A. Refer to Section 06 1600 "Sheathing" for underlayment.

2.5 MISCELLANEOUS MATERIALS

- A. Steel Drill Screws: For metal-to-metal fastening, ASTM C 1002 or ASTM C 954, as required by thickness of metal being fastened; with pan head that is suitable for application; in lengths required to achieve penetration through joined materials of no fewer than three exposed threads.
- B. Fasteners for Attaching Metal Lath to Substrates: Complying with ASTM C 1063.
- C. Fasteners for Attaching Metal Lath to Concrete Substrates: Complying with ASTM C 1063, Sections 7.10.4 and 7.10.5.
 1. Low velocity power and powder actuated fasteners, ITW Ramset Trakfast or similar, zinc coated fasteners as follows:
 - a. Shank Diameter: 0.109
 - b. Embedment: 3/4-inch, minimum
- D. Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, not less than 0.0475-inch (1.21-mm) diameter, unless otherwise indicated.

PART 3 - EXECUTION

3.1 INSTALLATION OF METAL LATH

- A. Exterior Surfaces: Comply with CBC Section 2506, ANSI/MLSFA A42.3 and as specified.
 1. General: Install metal lath over gypsum sheathing and building paper at walls and over suspended ceiling framing at soffits, as indicated.

2. Attach to metal framing or solid backing with approved fasteners spaced 6-inches apart. Use wire ties or screws at metal framing and powder driven wide-shouldered forced entry fasteners at solid backing.
3. Where solid backing is not provided, apply with long dimension of sheets perpendicular to supports.
4. Lap sides not less than 1/2-inch and ends not less than 1-inch. Lap wire fabric not less than one mesh at sides and ends or 1-inch, whichever is greater. Lap rib lath at sides by nesting outside ribs.
5. Where solid backing is not provided, securely tie ends of lapped sheets not occurring over supports with minimum 18-gauge tie wire.
6. Metal lath shall be continuous in corners.
7. Insert lath as far as possible into reentrant space of metal frames, and notch to pass around jamb anchors.
8. Where no external corner reinforcement is used, lath shall be furred out and carried around corners at least one support on frame construction.

3.2 INSTALLATION OF METAL ACCESSORIES

A. General:

1. Fasten in place as required to prevent dislodging or misalignment by subsequent operations.
2. Fasten at both ends and at a maximum of 12-inches on center along sides.
3. Bring grounding edge of accessories to true lines, plumb, level, and straight.
4. Install accessories to provide required depth of plaster and to bring plaster surface to required plane.
5. Connect lengths of accessories as recommended by the manufacturer to assure a continuous line.
6. Install continuous corner reinforcement for full length of external corners.
7. Install casing beads to provide a minimum 1/8-inch clearance between structural units and termination points of surfaces to receive plaster finish.

B. Beads:

1. Use single length of metal beads wherever length of run does not exceed longest standard stock length available; miter or cope corners.
2. Set beads level, plumb, and true to line. Shim as required and align joints with concealed splices or tie plates.
3. Provide casing beads at the following locations:
4. Where plaster abuts dissimilar construction.

C. At perimeter of openings where edges of plaster will not be concealed by other work.

3.3 INSTALLATION OF UNDERLAYMENT

- A. Refer to Section 06 1600 "Sheathing" for underlayment installation.

- END OF SECTION -

- SECTION 09 2116 -

GYPSUM BOARD SHAFT WALL ASSEMBLIES

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. Shaft Enclosures
 - 2. Chase Enclosures
 - 3. Stair Enclosures
 - 4. Horizontal enclosures.

1.3 RELATED SECTIONS

- A. Section 01 74 19 "Materials Recycling & Waste Management".
- B. Section 01 81 13 "LEED Certification Requirements".
- C. Section 07 8446 "Fire-Resistive Joint Systems" for head-of-wall assemblies that incorporate gypsum board shaft-wall assemblies
- D. Section 09 2216 "Non-Structural Metal Framing" for non-load bearing metal framing.
- E. Section 09 2900 "Gypsum Board" for sheathing and finishes.

1.4 DEFINITIONS

- A. Gypsum Board Construction Terminology: Refer to ASTM C 11 for definitions of terms for gypsum board construction not defined in this Section or in other referenced standards.

1.5 PERFORMANCE REQUIREMENTS

- A. Structural Performance:
1. Provide gypsum board shaft-wall assemblies capable of withstanding the full air-pressure loads indicated for maximum heights of partitions without failing and while maintaining an airtight and smoke-tight seal. Evidence of failure includes deflections exceeding limits indicated, bending stresses causing studs to break or to distort, and end-reaction shear causing track (runners) to bend or to shear and studs to become crippled.

1.6 SUBMITTALS

- A. Assembly test reports from a qualified independent testing agency certifying and substantiating compliance of gypsum board shaft-wall assemblies with structural and sound-attenuation performance requirements based on tests performed on manufacturers' standard assemblies representing those indicated.
- B. LEED Submittals: See Section 018113 LEED Certification Requirements for the following:
1. Product Data for Credit EQ 4.1: For adhesives and sealants, including printed statement of VOC content.
 2. Product Data for Credit MR 4.1 and Credit MR 4.2: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
 - a. Include statement indicating costs for each product having recycled content.
 3. MRc5 Regional Materials:
 - a. Sourcing location(s): indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery from the project site.
 - b. Manufacturing location(s): indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
 - c. Product Value: indicate dollar value of product containing regional materials; include materials costs only.
 - d. Product Component(s) Value: Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.

1.7 QUALITY ASSURANCE

- A. Fire-Resistance-Rated Assemblies: Provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.
1. Fire-Resistance-Rated Assemblies: Indicated by design designations from FM's "Approval Guide, Building Products" and UL's "Fire Resistance Directory."
- B. STC-Rated Assemblies: For gypsum board shaft-wall assemblies indicated to have STC ratings, provide assembly materials and construction complying with requirements of assemblies whose STC ratings were determined according to ASTM E 90 and classified according to ASTM E 413 by a qualified independent testing agency.

GYPSUM BOARD SHAFT WALL ASSEMBLIES

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages, containers, and bundles bearing brand name and identification of manufacturer or supplier.
- B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Stack gypsum panels flat on leveled supports off the ground to prevent sagging.

1.9 PROJECT CONDITIONS

- A. Comply with requirements for environmental conditions, room temperatures, and ventilation specified in Section 09 2900 "Gypsum Board".

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. Approved Manufacturers:
 1. G-P Gypsum Corporation, Georgia-Pacific Company (800-284-5347)
 2. National Gypsum Company, Gold Bond Building Products Div. (800-628-4662).
 3. United States Gypsum Co. (800-874-4968)

2.2 ASSEMBLY MATERIALS

- A. General: Provide materials and components complying with requirements of fire-resistance-rated assemblies indicated.
 1. Provide panels in maximum lengths available to eliminate or minimize end-to-end butt joints.
 2. Provide auxiliary materials complying with gypsum board shaft-wall assembly manufacturer's written recommendations.
- B. Steel Framing: ASTM C 645.
 1. Protective Coating: ASTM A 653, G40, hot-dip galvanized coating
- C. Gypsum Shaft-Liner Panels:
 1. Acceptable Manufacturer:
 - a. "Dens-Glass Ultra Shaftliner"; G-P Gypsum Corporation
 - b. "Sheetrock Brand Gypsum Liner Panels - Enhanced"; United States Gypsum Co..
 2. Type "X", 1" thick water resistant gypsum core surfaced with coated glass mat facings that resist growth of mold and mildew and does not support fungus growth per ASTM D 3273 "Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber".
- D. Gypsum Wallboard: ASTM C 36, core type as required by fire-resistance-rated assembly indicated.
 1. Refer to Section 09 2900 "Gypsum Board".

- E. Accessories: Cornerbead, edge trim, and control joints of material and shapes specified in Section 09 2900 "Gypsum Board", that comply with gypsum board shaft-wall assembly manufacturer's written recommendations for application indicated.
- F. Gypsum Wallboard Joint-Treatment Materials: ASTM C 475 and as specified in Section 09 2900 "Gypsum Board".
- G. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
 - 1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
- H. Track (Runner) Fasteners: Power-driven fasteners of size and material required to withstand loading conditions imposed on shaft-wall assemblies without exceeding allowable design stress of track, fasteners, or structural substrates in which anchors are embedded.
- I. Acoustical Sealant: As specified in Section 09 2900 "Gypsum Board".

2.3 GYPSUM BOARD SHAFT WALL

- A. Basis-of-Design Product: As indicated on Drawings by design designation of a qualified testing and inspecting agency.
- B. Deflection Limit: $L/240$
- C. Studs: Manufacturer's standard profile for repetitive members and corner and end members and for fire-resistance-rated assembly indicated.
 - 1. Depth: As indicated.
 - 2. Minimum Base Metal Thickness: As indicated on Drawings.
- D. Track (Runner): Manufacturer's standard J-profile track with long-leg length as standard with manufacturer.
 - 1. Minimum Base Metal Thickness: As indicated on Drawings.
- E. Jamb Struts: Manufacturer's standard J-profile strut with long-leg length of 3 inches, in depth matching studs, and not less than 0.0341 inch thick.
- F. STC Rating: As indicated on Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates to which gypsum board shaft-wall assemblies attach or abut, with Installer present, including hollow-metal frames, elevator hoistway door frames, cast-in anchors, and structural framing. Examine for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install gypsum board shaft-wall assemblies to comply with requirements of fire-resistance-rated assemblies indicated, manufacturer's written installation instructions, and the following:
 - 1. ASTM C 754 for installing steel framing.
 - 2. Section 09 2900 "Gypsum Board", for applying and finishing panels.
- B. Do not bridge building expansion joints with shaft-wall assemblies; frame both sides of joints with furring and other support.
- C. Install supplementary framing in gypsum board shaft-wall assemblies around openings and as required for blocking, bracing, and support of gravity and pullout loads of fixtures, equipment, services, heavy trim, furnishings, and similar items that cannot be supported directly by shaft-wall assembly framing.
 - 1. At elevator hoistway door frames, provide jamb struts on each side of door frame.
 - 2. Where handrails directly attach to gypsum board shaft-wall assemblies, provide galvanized steel reinforcing strip, accurately positioned and secured behind at least 1 face-layer panel. Size of reinforcing plate as shown on Drawings.
- D. Integrate stair hanger rods with gypsum board shaft-wall assemblies by locating cavity of assemblies where required to enclose rods.
- E. At penetrations in shaft wall, maintain fire-resistance rating of shaft-wall assembly by installing supplementary steel framing around perimeter of penetration and fire protection behind boxes containing wiring devices, elevator call buttons, elevator floor indicators, and similar items.
- F. Isolate gypsum finish panels from building structure to prevent cracking of finish panels while maintaining continuity of fire-rated construction.
- G. Install control joints to maintain fire-resistance rating of assemblies.
- H. Seal gypsum board shaft walls with acoustical sealant at perimeter of each assembly where it abuts other work and at joints and penetrations within each assembly. Install acoustical sealant to withstand dislocation by air-pressure differential between shaft and external spaces; maintain an airtight and smoke-tight seal; and comply with manufacturer's written instructions or ASTM C 919, whichever is more stringent.
- I. In elevator shafts where gypsum board shaft-wall assemblies cannot be positioned within 2 inches of the shaft face of structural beams, floor edges, and similar projections into shaft, install 5/8-inch-thick, gypsum board cants covering tops of projections.
 - 1. Slope cant panels at least 75 degrees from horizontal. Set base edge of panels in adhesive and secure top edges to shaft walls at 24 inches o.c. with screws fastened to shaft-wall framing.
 - 2. Where steel framing is required to support gypsum board cants, install framing at 24 inches o.c. and extend studs from the projection to the shaft-wall framing.

- END OF SECTION -

- SECTION 09 2216 -**NON-STRUCTURAL METAL FRAMING**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. This Section includes non-load-bearing steel framing members for the following applications:
 - 1. Interior framing systems (e.g., supports for partition walls, framed soffits, furring, etc.).
 - 2. Interior suspension systems (e.g., supports for ceilings, suspended soffits, etc.).

1.3 RELATED SECTIONS

- A. Section 01 74 19 "Materials Recycling & Waste Management".
- B. Section 01 81 13 "LEED Certification Requirements".
- C. Section 05 4000 "Cold-Formed Metal Framing" for exterior and interior load-bearing and exterior non-load-bearing wall studs; floor joists; roof rafters and ceiling joists; and roof trusses.
- D. Section 07 2100 "Thermal Insulation" for insulation installed with Z-shaped furring members.
- E. Section 07 8446 "Fire-Resistive Joint Systems" for head-of-wall joint systems installed with non-load-bearing steel framing.
- F. Section 09 2116 "Gypsum Board Shaft-Wall Assemblies" for non-load-bearing metal shaft-wall framing, gypsum panels, and other components of shaft-wall assemblies.
- G. Section 09 2900 "Gypsum Board" for gypsum panels.

1.4 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide cold-formed metal framing and firestop tracks capable of withstanding deflection within limits and under conditions indicated.
 - 1. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:
 - a. Upward and downward movement of 1 inch (25 mm).

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. LEED Submittal:
 - 1. Product Data for Credit MR 4.1 and Credit MR 4.2: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
 - a. Include statement indicating costs for each product having recycled content.

1.6 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

PART 2 - PRODUCTS

2.1 NON-LOAD-BEARING STEEL FRAMING, GENERAL

- A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
 - 1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal, unless otherwise indicated.
 - 2. Protective Coating: Coating with equivalent corrosion resistance of ASTM A 653/A 653M, **G40 (Z120)**], hot-dip galvanized, unless otherwise indicated.

2.2 SUSPENSION SYSTEM COMPONENTS

- A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, **0.0625-inch- (1.59-mm-)** diameter wire, or double strand of **0.0475-inch- (1.21-mm-)** diameter wire.
- B. Hanger Attachments to Concrete:
 - 1. Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching wire hangers and capable of sustaining, without failure, a load equal to 5 times that imposed by construction as determined by testing according to ASTM E 488 by an independent testing agency.
 - a. Type: Postinstalled, expansion anchor, such as .
- C. Powder-Actuated Fasteners: Suitable for application indicated, fabricated from corrosion-resistant materials with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to 10 times that imposed by construction as determined by testing according to ASTM E 1190 by an independent testing agency.

NON-STRUCTURAL METAL FRAMING

- D. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.162-inch (4.12-mm) diameter.
- E. Flat Hangers: Steel sheet, 1 by 3/16 inch (25.4 by 4.76 mm) by length indicated.
- F. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness, 0.05980-inch-minimum thickness of base (uncoated) metal and 7/16-inch-wide flanges, and as follows:
1. Carrying Channels: 2 inches deep, 590 lb per 1000 feet, unless otherwise indicated.
 2. Finish: G-60 hot-dip galvanized coating per ASTM A 525 for framing for exterior soffits and where indicated.
- G. Furring Channels (Furring Members):
1. Cold-Rolled Channels: 0.0538-inch (1.37-mm) bare-steel thickness, with minimum 1/2-inch- (12.7-mm-) wide flanges, 3/4 inch (19.1 mm) deep.
 2. Steel Studs: ASTM C 645.
 3. Minimum Base-Metal Thickness: 0.0312 inch (0.79 mm).
 4. Depth: As indicated on Drawings.
 5. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch (22.2 mm) deep.
 6. Minimum Base Metal Thickness: 0.0312 inch (0.79 mm).
 7. Resilient Furring Channels: 1/2-inch- (12.7-mm-) deep members designed to reduce sound transmission.
 - a. Configuration: Asymmetrical or hat shaped.
- H. Grid Suspension System for Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.
1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Armstrong World Industries, Inc.; Drywall Grid Systems.
 - b. Chicago Metallic Corporation; 660-C Drywall Furring System.
 - c. USG Corporation; Drywall Suspension System.

2.3 STEEL FRAMING FOR FRAMED ASSEMBLIES

- A. Steel Studs and Runners: ASTM C 645.
1. Minimum Base-Metal Thickness: 0.0312 inch (0.79 mm).
 2. Depth: As indicated on Drawings.
- B. Slip-Type Head Joints: Where indicated, provide the following:
1. Single Long-Leg Runner System: ASTM C 645 top runner with 2-inch- (50.8-mm-) deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top runner and with continuous bridging located within 12 inches (305 mm) of the top of studs to provide lateral bracing.

- C. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness compatible with studs and in width to accommodate depth of studs.
 - 1. Basis-of-Design Product: Grace Construction Products; FlameSafe® FlowTrak® System. Subject to compliance with requirements, provide the specified product or a comparable product from one of the following:
 - a. Fire Trak Corp.; Fire Trak attached to studs with Fire Trak Slip Clip.
 - b. Metal-Lite, Inc.; The System.
- D. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
 - 1. Minimum Base-Metal Thickness: 0.0312 inch (0.79 mm), r as indicated on drawings.
- E. Cold-Rolled Channel Bridging: 0.0538-inch (1.37-mm) bare-steel thickness, with minimum 1/2-inch- (12.7-mm-) wide flanges.
 - 1. Depth: As indicated on Drawings.
 - 2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches (38.1 by 38.1 mm), 0.068-inch- (1.73-mm-) thick, galvanized steel.
- F. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
 - 1. Minimum Base Metal Thickness: 0.0179 inch (0.45 mm), unless otherwise indicated..
 - 2. Depth: 7/8 inch (22.2 mm).
- G. Resilient Furring Channels: 1/2-inch- (12.7-mm-) deep, steel sheet members designed to reduce sound transmission.
 - 1. Configuration: Asymmetrical or hat shaped.
- H. Cold-Rolled Furring Channels: 0.0538-inch (1.37-mm) bare-steel thickness, with minimum 1/2-inch- (12.7-mm-) wide flanges.
 - 1. Depth: As indicated on Drawings.
 - 2. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum bare-steel thickness of 0.0312 inch (0.79 mm).
 - 3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch- (1.59-mm-) diameter wire, or double strand of 0.0475-inch- (1.21-mm-) diameter wire.
- I. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches (31.8 mm), wall attachment flange of 7/8 inch (22.2 mm), minimum bare-metal thickness of 0.0179 inch (0.45 mm), and depth required to fit insulation thickness indicated.

2.4 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards.
 - 1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.
 - 1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.
- B. Coordination with Sprayed Fire-Resistive Materials:
 - 1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than **24 inches (600 mm)** o.c.
 - 2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of non-load-bearing steel framing. Do not reduce thickness of fire-resistive materials below that required for fire-resistance ratings indicated. Protect adjacent fire-resistive materials from damage.

3.3 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C 754, except comply with framing sizes and spacing indicated.
 - 1. Gypsum Plaster Assemblies: Also comply with requirements in ASTM C 841 that apply to framing installation.
 - 2. Portland Cement Plaster Assemblies: Also comply with requirements in ASTM C 1063 that apply to framing installation.
 - 3. Gypsum Veneer Plaster Assemblies: Also comply with requirements in ASTM C 844 that apply to framing installation.
 - 4. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.
- B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- C. Install bracing at terminations in assemblies.
- D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING SUSPENSION SYSTEMS

- A. Install suspension system components in sizes and spacings indicated on Drawings, but not less than those required by referenced installation standards for assembly types and other assembly components indicated.
- B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
- C. Suspend hangers from building structure as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
 - a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - 2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
 - a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
 - 3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 - 4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 - 5. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.
- E. Seismic Bracing: Sway-brace suspension systems with hangers used for support.
- F. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.
- G. Installation Tolerances: Install suspension systems that are level to within **1/8 inch in 12 feet (3 mm in 3.6 m)]** measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

3.5 INSTALLING FRAMED ASSEMBLIES

- A. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- B. Install studs so flanges within framing system point in same direction.
 - 1. Space studs as follows:
 - a. Single-Layer Application: **16 inches (406 mm)** o.c., unless otherwise indicated.
 - b. Multilayer Application: **16 inches (406 mm)** o.c., unless otherwise indicated.

NON-STRUCTURAL METAL FRAMING

- c. Tile backing panels: 16 inches (406 mm) o.c., unless otherwise indicated.
- C. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.
1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
 2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
 - a. Install two studs at each jamb, unless otherwise indicated.
 - b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch (12.7-mm) clearance from jamb stud to allow for installation of control joint in finished assembly.
 - c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
 3. Other Framed Openings: Frame openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
 4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
 - a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
 5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
 6. Curved Partitions:
 - a. Bend track to uniform curve and locate straight lengths so they are tangent to arcs.
 - b. Begin and end each arc with a stud, and space intermediate studs equally along arcs. On straight lengths of not less than 2 studs at ends of arcs, place studs 6 inches (150 mm) o.c.
- D. Direct Furring:
1. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches (610 mm) o.c.
- E. Z-Furring Members:
1. Erect insulation (specified in Division 7 Section "Thermal Insulation") vertically and hold in place with Z-furring members spaced 24 inches (610 mm) o.c.
 2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches (600 mm) o.c.
 3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches (300 mm) from corner and cut insulation to fit.

- F. Installation Tolerance: Install each framing member so fastening surfaces vary not more than **1/8 inch (3 mm)** from the plane formed by faces of adjacent framing, ASTM C 840.

- END OF SECTION -

- SECTION 09 2400 -

PORTLAND CEMENT PLASTERING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section describes the requirements for furnishing and installing the following type(s) of portland-cement plaster:
 - 1. Exterior portland cement plasterwork (stucco) on metal lath and solid-plaster bases.
 - 2. Integral color acrylic finish coat.
 - 3. Liquid bonding agent over concrete and concrete masonry.
 - 4. Plaster accessories as required

1.3 RELATED SECTIONS

- A. Section 01 74 19 "Materials Recycling & Waste Management".
- B. Section 01 81 13 "LEED Certification Requirements".
- C. Section 03 3000 "Cast-in-Place Concrete" for direct application to cast-in-place substrate.
- D. Section 06160 "Sheathing" for sheathing and weather resistant sheathing membrane beneath plaster assembly.
- E. Section 07 6200 "Sheet Metal Flashing and Trim" for sheet metal flashing, trim and reglets.
- F. Section 07 9200 "Joint Sealants" for providing a watertight seal to adjacent materials.
- G. Section 09 2070 "Metal Lath and Accessories".

1.4 SUBMITTALS

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

- B. LEED Submittals:
 - 1. Product Data for Credit MR 4.1 and Credit MR 4.2: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
 - a. Include statement indicating costs for each product having recycled content.
- C. Shop Drawings: Show locations and installation of control and expansion joints including plans, elevations, sections, details of components, and attachments to other work.
- D. Samples for Initial Selection: For each type of factory-prepared finish coat indicated.
- E. Samples for Verification: For each type of colored finish coat indicated; 18 by 18 inches (457 by 457 mm), and prepared on rigid backing.
- F. Sand compliance certificates must be presented to the Architect with each load of sand.
- G. Installers Certificate, signed by manufacture. Technical representative certifying that installers comply with requirements under "Quality Assurance" Section

1.5 REFERENCE STANDARDS

- A. Resulting installed materials shall be acceptable in the jurisdiction of use. The work of this section shall comply with the latest editions of the following publications as applicable:
 - 1. California Building Code (CBC)
 - 2. International Conference of Building Officials (ICBO) Evaluation Service, Inc.—Evaluation Report Number ER-4617
 - 3. American Society for Testing and Materials (ASTM)—Related specifications, tests, and standards
 - a. ASTM: C1063 – Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement Based Plaster. C 926 – Application of Portland Cement Based Plaster.
 - 4. Gypsum Association—Fire Resistance Design Manual GA-600, 14th Edition
 - 5. APA The Engineered Wood Association
 - 6. NAAMM – ML/SFA 920 Guide Specification for Metal Lathing and Furring
 - 7. PCA – Portland Cement Plaster (Stucco) Manual
 - 8. ICBO Evaluation Service, Inc. - Evaluation Report Number ER-4617

1.6 QUALITY ASSURANCE

- A. The manufacturer or distributor should be capable of providing a local architectural representative to provide consultation.
 - 1. A technical consultant supplied by the manufacturer or local distributor should be contacted to consult the installer for the application of finish on all samples and mock-ups and during the actual application.
- B. Applicators Qualifications: Engage an experienced installer, who is certified, in writing by Plaster System as being qualified to install the plaster systems. The installer shall have 10

PORTLAND CEMENT PLASTERING

year's experience with the products to be used on this project and have successfully completed the installation of a minimum of 50,000 square feet of the specified product.

- C. Pre-installation Meeting: Plan and conduct a pre-installation meeting at the project site prior to the installation of any wall materials (including mock-ups). This meeting is to be attended by the Architect, General Contractor, Applicator of the system and the Technical Consultant, supplied by the local distributor.
 - 1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- D. Mockups: Prior to the installation of the plaster system work, provide a mock-up panel to demonstrate aesthetic effects and set quality standards for materials and execution. Panel must be constructed as per the Architects size and dimension requirements using materials specified for final work. The panel must be constructed as per the Architects size and dimension requirements. Demonstrate the proposed range of color, texture and workmanship to be expected in the completed work. Show a cut-away in the panel exposing the weather barrier, metal lath and drainage weep of the system on a perimeter edge of the panel. Obtain Architect's acceptance of visual qualities of the sample panel..
 - 1. Panel Size: Unless otherwise noted; provide a mock-up panel 8 feet by 8 feet into the wall/roof mock-up required for the project. Mock-up installed to show finish and terminations adjacent to material used in project. Mock-up to show plaster at returns and corners.
 - 2. Additional panels to be constructed as need until finish, color and consistency is approved by Architect.
 - 3. Maintain sample panel throughout the construction process and dispose of when project is completed.
- E. The work shall be free from excessive non-uniformity. The surface of the finish shall show consistency and uniformity that is within the same standards set by other projects of similar scope, using the same materials and good plastering practices, in the immediate geographic area to the project specified herein.
- F. Non-uniformity visible under critical lighting means shadowing or reflection on the surface of the finish that may highlight non-uniformity and/or undulations. Under critical lighting, the appearance of the finish shall be within industry standards set by other projects of similar scope, using similar materials and good plastering practices, in the immediate geographical area to the project specified herein.
- G. Scaffolds and Equipment:
 - 1. Install and maintain all necessary scaffolds, staging, trestles and planking, in strict conformance with CCR Title 8 and all applicable laws and ordinances.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes.
- B. Sand must be placed on a protective surface and covered when not in use.

1.8 PROJECT CONDITIONS

- A. Comply with ASTM C 926 requirements.
- B. Exterior Plasterwork:
 - 1. Apply and cure plaster to prevent plaster drying out during curing period. Use procedures required by climatic conditions, including moist curing, providing coverings, and providing barriers to deflect sunlight and wind.
 - 2. Allow cast-in-place concrete to cure to fully cure at a minimum of 28days prior to applying base coat or accessories.
 - 3. Apply plaster when ambient temperature is greater than 40 deg F (4.4 deg C) not to exceed 110 deg F (44.4 deg C). Ambient air temperature must be maintained at a minimum of 40 deg °F (4°C) or higher for at least 24 hours after application to allow proper curing.
 - 4. Protect plaster coats from freezing for not less than 48 hours after set of plaster coat has occurred.
- C. Factory-Prepared Finishes: Comply with manufacturer's written recommendations for environmental conditions for applying finishes.

PART 2 - PRODUCTS

2.1 METAL LATH

- 1. Refer to Section 09 2070 for metal lath and accessories.

2.2 ACCESSORIES

- A. General: Comply with ASTM C 1063 and coordinate depth of trim and accessories with thicknesses and number of plaster coats required.
- B. Metal Accessories:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Alabama Metal Industries Corporation; a Gibraltar Industries company.
 - b. CEMCO.
 - c. Clark Western Building Systems.
 - d. Delta Star, Inc; Superior Metal Trim.
 - e. Dietrich Metal Framing; a Worthington Industries company.
 - f. MarinoWARE.
 - g. Phillips Manufacturing Co.
 - h. Stockton Products.
 - 2. Foundation Weep Screed: Fabricated from hot-dip galvanized-steel sheet, ASTM A 653/A 653M, G60 (Z180) zinc coating.
 - 3. Cornerite: Fabricated from metal lath with ASTM A 653/A 653M, G60 (Z180), hot-dip galvanized zinc coating.

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4. External-Corner Reinforcement: Fabricated from metal lath with ASTM A 653/A 653M, **G60 (Z180)**, hot-dip galvanized zinc coating.
5. Cornerbeads: Fabricated from zinc or zinc-coated (galvanized) steel.
 - a. Small nose cornerbead with expanded flanges; use unless otherwise indicated.
6. Casing Beads: Fabricated from zinc or zinc-coated (galvanized) steel; square-edged style; with expanded flanges.
7. Control Joints: Fabricated from zinc or zinc-coated (galvanized) steel; one-piece-type, folded pair of unperforated screeds in M-shaped configuration; with perforated flanges and removable protective tape on plaster face of control joint.
8. Expansion Joints: Fabricated from zinc or zinc-coated (galvanized) steel; folded pair of unperforated screeds in M-shaped configuration; with expanded flanges.
9. Two-Piece Expansion Joints: Fabricated from zinc or zinc-coated (galvanized) steel; formed to produce slip-joint and square-edged reveal that is adjustable from **1/4 to 5/8 inch (6.34 to 16 mm)** wide; with perforated flanges.

2.3 MISCELLANEOUS MATERIALS

- A. Water for Mixing: Potable and free of substances capable of affecting plaster set or of damaging plaster, lath, or accessories.
- B. Fiber for Base Coat: Alkaline-resistant glass or polypropylene fibers, **1/2 inch (13 mm)** long, free of contaminants, manufactured for use in portland cement plaster.
- C. Bonding Compound: ASTM C 932.
- D. Steel Drill Screws: For metal-to-metal fastening, ASTM C 1002 or ASTM C 954, as required by thickness of metal being fastened; with pan head that is suitable for application; in lengths required to achieve penetration through joined materials of no fewer than three exposed threads.
- E. Fasteners for Attaching Metal Lath to Substrates: Complying with ASTM C 1063.
- F. Fasteners for Attaching Metal Lath to Concrete Substrates: Complying with ASTM C 1063, Sections 7.10.4 and 7.10.5.
 1. Low velocity power and powder actuated fasteners, ITW Ramset Trakfast or similar, zinc coated fasteners as follows:
 - a. Shank Diameter: 0.109
 - b. Embedment: 3/4-inch, minimum
- G. Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, not less than **0.0475-inch (1.21-mm)** diameter, unless otherwise indicated.
- H. Sealant: As specified in Division 7 Section 07 9200 "Joint Sealants".

2.4 PLASTER MATERIALS

- A. Basis of Design: Parex DPR Acrylic Finish as manufactured by ParexLahabra, Inc. French Camp, CA. tel: (209) 983-8002 or (800) 983-6953, fax (209) 983-1431, web: www.parex.com.

- B. Multi-Coat Acrylic-Based Finish Coatings: Factory-mixed acrylic-emulsion coating systems, formulated with colorfast mineral pigments and fine aggregates; for use over portland cement plaster base coats. Include manufacturer's recommended primers and sealing topcoats for acrylic-based finishes.
 - 1. Parex Finish: Factory blended 100% acrylic polymer based finish, integrally colored. Finish type, texture and color as follows.
 - a. Color: Match Architect's sample
 - b. Textures:
 - 1) Ultra Sand Smooth.
 - 2) Raked to match Architect's sample.
- C. Fiber-reinforced Portland cement stucco base
 - 1. Fiber-47 Concentrate: Manufacturer's standard pre-mixed stucco basecoats consisting of portland cement and alkali resistant fiberglass and acrylic fibers and proprietary ingredients.
 - 2. Jobsite added sand:
 - a. ASTM C897, washed natural sand and graded conforming to ASTM C926
 - 3. Waterproofing Admix: Red Label Suconem by Super Concrete Emulsions Ltd.,
 - a. Anti-Hydro, or approved equal.
- D. Adacryl: 100 percent acrylic emulsion additive for portland cement based products, to enhance curing, adhesion, freeze-thaw resistance and workability.
- E. Bonding Agent: acrylic polymer based bonding agent for portland cement based products to increase shear bond adhesion.
- F. Primers:
 - 1. Primer 310: 100% acrylic based coating to prepare surfaces for Parex finishes.
 - 2. Parex tintable primer, or approved equal.
- G. Water: Clean, potable and from domestic source.
- H. Plastic Cement: ASTM C 1328.
- I. Lime: ASTM C 206, Type S; or ASTM C 207, Type S.

2.5 PLASTER MIXES

- A. General: Comply with ASTM C 926 for applications indicated.
 - 1. Accurately proportion materials for each stucco batch with measuring devices of known volume.
 - 2. Size batches for complete use within maximum of one hour after mixing.
 - 3. Re-temper stucco stiffened from evaporation, but do not use or re-temper partially hydrated cement stucco.
 - 4. Do not use frozen, caked or lumpy materials, and remove such materials from jobsite immediately.
 - 5. Mix factory prepared cement stucco in accordance with manufacturer's written instructions.

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6. Use moist, loose sand in proportions recommended by basecoat concentrate manufacturer.
 7. Withhold 10% of mixing water until mixing is nearly complete, then add as needed to produce desired working consistency.
- B. Base-Coat Mixes for Use over Metal Lath: Scratch and brown coats for three-coat plasterwork using Parex 47, or approved equal a fiber-reinforced factory blended scratch and brown mix for plaster systems having to conform to ASTM C 926-97 as follows:
- C. Factory-Prepared Finish-Coat Mixes: For acrylic-based finish coatings, comply with manufacturer's written instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Protect adjacent work from soiling, spattering, moisture deterioration, and other harmful effects caused by plastering.
- B. Prepare solid substrates for plaster that are smooth or that do not have the suction capability required to bond with plaster according to ASTM C 926.

3.3 INSTALLATION, GENERAL

- A. Exterior Sealant: Where required, seal joints between edges of plasterwork and abutting construction with sealant as specified in Section 07 9200.

3.4 INSTALLING ACCESSORIES

- A. Install according to ASTM C 1063 and at locations indicated on Drawings.
- B. Reinforcement for External Corners:
 1. Install lath-type, external-corner reinforcement at exterior locations.
 2. Install cornerbead at interior and exterior locations.
- C. Control Joints: Install control joints in specific locations approved by Architect for visual effect as follows:
 1. As required to delineate plasterwork into areas (panels) of the following maximum sizes:
 - a. Vertical Surfaces: 144 sq. ft. (13.4 sq. m).

- b. Horizontal and other Nonvertical Surfaces: 100 sq. ft. (9.3 sq. m).
2. At distances between control joints of not greater than 18 feet (5.5 m) o.c.
3. As required to delineate plasterwork into areas (panels) with length-to-width ratios of not greater than 2-1/2:1.
4. Where control joints occur in surface of construction directly behind plaster.
5. Where plasterwork areas change dimensions, to delineate rectangular-shaped areas (panels) and to relieve the stress that occurs at the corner formed by the dimension change.

3.5 PLASTER APPLICATION

- A. General: Comply with ASTM C 926.
 1. Do not deviate more than plus or minus 1/4 inch in 10 feet (6.4 mm in 3 m) from a true plane on finished plaster surfaces, as measured by a 10-foot (3-m) straightedge placed on surface.
 2. Finish plaster flush with metal frames and other built-in metal items or accessories that act as a plaster ground unless otherwise indicated. Where casing bead does not terminate plaster at metal frame, cut base coat free from metal frame before plaster sets and groove finish coat at junctures with metal.
 3. Provide plaster surfaces that are ready to receive field-applied finishes indicated.
- B. Bonding Compound: Apply on unit masonry and concrete plaster bases.
- C. Number of Coats: Provide three-coat application over metal lath in accordance with ASTM C926.
 1. Apply plaster by hand or machine spray. If machine applied, use only experienced machine applicator foreman and nozzle man. Slump for machine applied plaster shall be between 2-1/2- to 4-inches at mixer and 2- to 3-1/2-inches at nozzle.
 2. Interrupt plaster coats only at junctions of plaster planes, at openings, or at control joints.
 3. Apply scratch coat with sufficient material and pressure to form full keys through and to embed metal base. When firm, score in one direction.
 4. Apply brown coat to scratch coat, bringing out to grounds, flat to true surface, and free of imperfections that would reflect in finish coat.
 5. Reconsolidate brown coat by floating, and roughen to assure bond with finish coat.
 6. Apply finish coat in accordance with manufacturer's instructions and uniformly float to true, even surface.
 7. Nominal Plaster Thickness Measured from Face of Lath, in accordance with ASTM C929, Table 4:
 - a. Vertical Surfaces:
 - 1) Scratch Coat: 3/8-inch, minimum.
 - 2) Brown Coat: 3/8-inch.
 - 3) Finish Coat: 1/8-inch, minimum.
 - b. Horizontal Surfaces:
 - 1) Scratch Coat: 1/4-inch.
 - 2) Brown Coat: 1/4-inch.
 - 3) Finish Coat: 1/8-inch.

- D. Ceilings; Base-Coat Mixes for Use over Metal Lath: Scratch and brown coats for three-coat plasterwork; 1/2 inch (13 mm) thick, 3/4 inch (19 mm) thick on concrete.
1. Application of Base Coats on Lath:
 - a. Scratch Coat: Apply scratch coat not less than 3/8" thick from face of supports to crest of scores, completely embedding and forming good key on metal lath. Thoroughly scratch in one direction only and keep at optimum moisture content with fog spray for 48 hours minimum before second coat is applied.
 - b. Brown Coat: Reconsolidate brown coat by only lightly floating after hydration of the cement has commenced and sufficient moisture has evaporated, so that surface sheen has disappeared, but before the base/brown coat has become to rigid to be moved under float.
 - c. Using a (Conventional) steel trowel cut back around trim edges approximately 1/16th of an inch, this will allow the finish to level off flush to the trim edges.
 - d. Leave the face of the base coat only slightly rough using a steel trowel to receive finish.
 - e. Maintain the brown coat moist for 48 hours, and allow to air cure for 7 days before applying acrylic skim coat.
- E. Number of Coats: Provide two-coat application over masonry surfaces in accordance with ASTM C926.
1. Apply brown/scratch coat, flat to true surface, and free of imperfections that would reflect in finish coat.
 2. Reconsolidate brown coat by floating, and roughen to assure bond with finish coat.
 3. Apply finish coat in accordance with manufacturer's instructions and uniformly float to true, even surface.
 4. Nominal Plaster Thickness Measured from Face of masonry, in accordance with ASTM C929, Table 4:
 - a. Vertical Surfaces:
 - 1) Brown Coat: 3/8-inch.
 - 2) Finish Coat: 1/8-inch, minimum.
 - b. Horizontal Surfaces:
 - 1) Brown Coat: 3/8-inch.
 - 2) Finish Coat: 1/8-inch.
- F. Primer Application: Apply to all plaster surfaces using roller or spray equipment.
- G. Acrylic-Based Finish Coatings: Apply coating system, including primers, finish coats, and sealing topcoats, according to manufacturer's written instructions and as follows:
1. Apply first coat of Plaster System Smooth Sand Finish approximately 1/16th of an inch over entire skim coated panel using a steel trowel, allow for the first coat to begin its set, then double back with a second coat using hard plastic float.
 2. Apply the second coat approximately 1/16th of an inch and allow for the material to achieve a slight set, then float to a light sand without leaving directional lines and or burnish marks to a uniform surface.
 3. Work so that the entire wall can be completed at one time so as to eliminate joining lines and overlaps. Overlaps and cold joints are unacceptable and will be rejected.

3.6 FINISH

- A. Cement Finish: Mix in accordance with the appropriate sections of IBC Table 25A-F.
 - 1. Exterior: Smooth float texture cement plaster shall be in accordance with the manufacturers recommendation for Smooth Float Portland Cement Plaster.
 - 2. Tolerances: Maximum variation from true flatness shall be 1/4-inch in 10 feet.

3.7 PLASTER REPAIRS

- A. Repair or replace work to eliminate cracks, dents, blemishes, blisters, pits, buckles, crazing and check cracking, dry outs, discolorations, efflorescence, sweat outs, and similar defects and where bond to substrate has failed.
- B. Remove defective plaster and replace with conforming modified plaster as approved by manufacture. Restore surfaces damaged, stained, or defaced by plastering as directed to match adjacent areas to the acceptance of the Architect.

3.8 FIELD QUALITY CONTROL

- A. Independent third party sand testing may be required at the request of the Architect/Owner.

3.9 PROTECTION

- A. Remove temporary protection and enclosure of other work. Promptly remove plaster from door frames, windows, and other surfaces not indicated to be plastered. Repair floors, walls, and other surfaces stained, marred, or otherwise damaged during plastering

- END OF SECTION -

- SECTION 09 2710 -**GLASS-REINFORCED GYPSUM FABRICATIONS**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. This Section includes factory-molded, glass-reinforced gypsum (GRG) fabrications for ceiling access panels.

1.3 RELATED SECTIONS

- A. Section 01 74 19 "Materials Recycling & Waste Management".
- B. Section 01 81 13 "LEED Certification Requirements".
- C. Section 09 2216 "Non-Structural Metal Framing" for steel framing, blocking, and bracing supporting GRG fabrications.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, weights, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: Show profiles, thicknesses, embedded supports, and anchorage details for fabrications. Indicate requirements for joint treatment, clearances, and attachment to supports.
- C. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
 - 1. Ceiling suspension assembly members.
 - 2. Method of attaching hangers to GRG fabrications and to building structure.
 - 3. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and moldings.
- D. Samples: For each exposed product in each profile and size required, and as follows:
 - 1. Submit three 8 inch x 8 inch (203 mm x 203 mm) G.R.G. flat samples for paint selection.

- E. LEED Submittal: See Section 018113 LEED Certification Requirements for the following:
1. MRc4 Recycled Content: Product data for products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content.
 - a. Include cost information for each product having recycled content.
 2. MRc5 Regional Materials:
 - a. Sourcing location(s): indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery from the project site.
 - b. Manufacturing location(s): indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
 - c. Product Value: indicate dollar value of product containing regional materials; include materials costs only.
 - d. Product Component(s) Value: Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.
 3. EQc4.1 Adhesives & Sealants: Product data for adhesives & sealants, including printed statement of VOC content and chemical components.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Comply with ASTM C 1467/C 1467M.

1.6 PROJECT CONDITIONS

- A. Environmental Conditions:
1. Comply with requirements in ASTM C 1467/C 1467M.
 2. Do not deliver or install GRG fabrications until building is enclosed, wet work is complete, and HVAC system is operating and continuously maintaining temperature and relative humidity at levels intended for building occupants.
- B. Conditioning: Acclimatize GRG fabrications to ambient temperature and humidity of spaces in which they will be installed. Remove packaging and move units into installation spaces not less than 48 hours before installing them.
- C. Field Measurements: Where GRG fabrications 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.

1.7 COORDINATION

- A. Coordinate layout and installation of GRG fabrications with support components specified in other Sections.

GLASS-REINFORCED GYPSUM FABRICATIONS

PART 2 - PRODUCTS

2.1 GRG FABRICATIONS

- A. Fabrications: Molded, glass-reinforced gypsum units complying with ASTM C 1381.
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. InterSource Specialties Company, Plymouth, WI, tel: (920) 892-8822, web: www.intersourceco.com
 - b. IntexForms, Inc., Sacramento, CA, tel: (916) 388-9933, web: www.intexforms.com
- B. Embedments: As standard with GRG fabrication manufacturer and as required for reinforcement and for anchorage to substrates and framing.

2.2 AUXILIARY MATERIALS

- A. Steel Drill Screws: Of sufficient length and size to securely fasten GRG fabrications to framing members, and as follows:
 - 1. Screws complying with ASTM C 1002 for fastening GRG fabrications to steel members less than 0.033 inch (0.84 mm) thick.
 - 2. Screws complying with ASTM C 954 for fastening GRG fabrications to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.
- B. Joint-Treatment Materials: ASTM C 475/C 475M.

2.3 FABRICATION

- A. Fabricate GRG units to comply with ASTM C 1381, with smooth-finished surfaces; repair hollows, voids, scratches, and other surface imperfections. Fabricate units in lengths and sizes that will minimize number of joints between abutting units.
- B. Embedments: Incorporate embedments into units to develop the full strength of GRG fabrications. Cover embedments with not less than **3/16-inch (5-mm)** thickness of GRG composite.
- C. Connection Hardware: Designed and fabricated to support and connect GRG fabrications to hangers, support framing, and substrates.

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

3.2 GRG INSTALLATION

- A. Comply with requirements in ASTM C 1467/C 1467M.
- B. Install GRG fabrications level, plumb, true, and aligned with adjacent materials. Use concealed shims where required for alignment.
- C. Attach GRG fabrications to framing and substrates with steel drill screws, unless otherwise indicated. Do not use pneumatic staple guns. Countersink screw heads below adjoining finished surface.
 - 1. Predrill fastener holes in units. Clean fastener holes to remove dirt and oil.
 - 2. Locate fasteners not less than 5/16 inch (7.9 mm) from edges or ends of units.
- D. Use joint-treatment materials to finish GRG fabrications to produce surfaces ready to receive primers and paint finishes specified in other Division 9 Sections.
 - 1. Finish joints between units, other than control joints, and countersunk fastener heads to comply with ASTM C 840 for Level 4 and to match surface texture of units.
 - 2. Repair hollows, voids, scratches, and other surface imperfections on units.
- E. Schedule of Rooms:
 - 1. Rooms: 111, 114A, 114B, 150, 160, 205A, 206C, 251A, 263, 319A and 351.

- END OF SECTION -

- SECTION 09 2900 -

GYPSUM BOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Interior gypsum wall board, including moisture resistant gypsum wall board.

1.3 RELATED SECTIONS

- A. Section 01 74 19 "Materials Recycling & Waste Management".
- B. Section 01 81 13 "LEED Certification Requirements".
- C. Section 05 4000 "Cold-Formed Metal Framing" for load-bearing steel framing that supports gypsum board.
- D. Section 07 2100 "Thermal Insulation" for insulation and vapor retarders installed in assemblies that incorporate gypsum board.
- E. Section 07 8446 "Fire-Resistive Joint Systems" for head-of-wall assemblies that incorporate gypsum board.
- F. Section 09 2216 "Non-Structural Metal Framing" for interior suspension systems.
- G. Section 09 2116 "Gypsum Board Shaft Wall Assemblies" for metal shaft-wall framing, gypsum shaft liners, and other components of shaft-wall assemblies.
- H. Section 09 3013 "Ceramic Tile" for coordination of tile over the gypsum board and glass-mat, water-resistant backing board.
- I. Section 09 8100 "Acoustical Insulation" for acoustical insulation installed in assemblies that incorporate gypsum board.
- J. Section 09 9123 "Interior Painting" for primers applied to interior gypsum board surfaces.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. LEED Submittal: See Section 018113 LEED Certification Requirements for the following:
 - 1. Product Data for Credit MR 4.1 and MR 4.2: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
 - a. Include statement indicating costs for each product having recycled content.
 - 2. Product Data for Credit EQ 4.1: For adhesives used to laminate gypsum board panels to substrates, including printed statement of VOC content.
 - 3. MRc5 Regional Materials:
 - a. Sourcing location(s): indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery from the project site.
 - b. Manufacturing location(s): indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
 - c. Product Value: indicate dollar value of product containing regional materials; include materials costs only.
 - d. Product Component(s) Value: Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.

1.5 QUALITY ASSURANCE

- 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. Mockups: Before beginning gypsum board installation, install mockups of at least **100 sq. ft. (9 sq. m)** in surface area to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Install mockups for the following:
 - a. Each level of gypsum board finish indicated for use in exposed locations.
 - 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.
 - a. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against damage from weather, condensation, direct sunlight, construction traffic, and other causes. Stack panels flat to prevent sagging.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.
- B. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS**2.1 PANELS, GENERAL**

- A. Size: Provide in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.2 INTERIOR GYPSUM BOARD

- A. General: Complying with ASTM C 36/C 36M or ASTM C 1396/C 1396M, as applicable to type of gypsum board indicated and whichever is more stringent.
- B. Wall Type:
 - 1. Type X:
 - 2. Thickness: 5/8 inch (15.9 mm).
 - 3. Long Edges: Tapered.
- C. Glass-Mat, Mold & Mildew Resistant Interior Wall Panel
 - 1. Manufacturer: "DensArmor Plus Interior Guard"; [G-P Gypsum Corporation](#) (800-225-6119)
 - 2. ASTM C1177, enhanced mold & mildew resistant gypsum core wallboard. Conforming to the physical properties of ASTM C36 and ASTM C1177 on Glass mat back. Rating of 10 "No Mold Growth" as tested for 4 weeks according to ASTM D3273.
 - a. Surfaces to be Painted: Coated inorganic glass mat-faced back and paper-faced front.
 - b. Surfaces to be covered with Wallcovering or other finish: Coated inorganic glass mat-faced back and front.
 - 3. Core: 5/8 inch, Type X
 - 4. Long Edges: Tapered.

- D. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. American Gypsum Co.
 - b. G-P Gypsum.
 - c. Lafarge North America Inc.
 - d. National Gypsum Company.
 - e. PABCO Gypsum.
 - f. USG Corporation.

- E. Flexible Type: Manufactured to bend to fit radii and to be more flexible than standard regular-type gypsum board of same thickness.
 - 1. Thickness: 1/4 inch (6.4 mm).
 - 2. Long Edges: Tapered.

- F. Ceiling Type: Manufactured to have more sag resistance than regular-type gypsum board.
 - 1. Thickness: 5/8 inch (15.9 mm), Type X.
 - 2. Long Edges: Tapered.

- G. Moisture- and Mold-Resistant Type: With moisture- and mold-resistant core and surfaces.
 - 1. Core: 5/8 inch (15.9 mm), Type X.
 - 2. Long Edges: Tapered.

2.3 TILE BACKING PANELS

- A. Water-Resistant Gypsum Backing Board: ASTM C 630/C 630M or ASTM C 1396/C 1396M.
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. American Gypsum Co.
 - b. BPB America Inc.
 - c. G-P Gypsum.
 - d. Lafarge North America Inc.
 - e. National Gypsum Company.
 - f. PABCO Gypsum.
 - g. Temple.
 - h. USG Corporation.
 - 2. Core: 5/8 inch (15.9 mm), Type X.

- B. Glass-Mat Interior Gypsum Board: ASTM C 1658/C 1658M. With fiberglass mat laminated to both sides. Specifically designed for interior use.
 - 1. Product: Subject to compliance with requirements, provide "DensArmor Plus Interior Guard" by G-P Gypsum.
 - 2. Core: Thickness as indicated on Drawings.

- C. Glass-Mat, Water-Resistant Tile Backing Board:
 - 1. Complying with ASTM C 1178/C 1178M.

GYPSUM BOARD

- a. Product: Subject to compliance with requirements, provide "DensShield Tile Guard" by G-P Gypsum.

2.4 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.
 1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
 2. Shapes:
 - a. Cornerbead.
 - b. Bullnose bead.
 - c. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - d. U-Bead: J-shaped; exposed short flange does not receive joint compound.
 - e. Expansion (control) joint.
 - f. Curved-Edge Cornerbead: With notched or flexible flanges.
- B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.
 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Fry Reglet Corp.
 - b. Gordon, Inc.
 - c. Pittcon Industries.
 2. Aluminum: Alloy and temper with not less than the strength and durability properties of **ASTM B 221 (ASTM B 221M)**, Alloy 6063-T5.
 3. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified.

2.5 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
 1. Interior Gypsum Wallboard: Paper.
 2. Exterior Gypsum Soffit Board: Paper.
 3. Tile Backing Panels: As recommended by panel manufacturer.
- C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
 1. Prefilling: At open joints and damaged surface areas, use setting-type taping compound.
 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use drying-type, all-purpose compound.
 - a. Use setting-type compound for installing paper-faced metal trim accessories.
 3. Fill Coat: For second coat, use drying-type, all-purpose compound.
 4. Finish Coat: For third coat, use drying-type, all-purpose compound.
 5. Skim Coat: For final coat of Level 5 finish, use drying-type, all-purpose compound.

- D. Joint Compound for Water-Resistant Panels:
 - 1. Water-Resistant Gypsum Backing Board: Use setting-type taping compound and setting-type, sandable topping compound.
 - 2. Glass-Mat, Water-Resistant Tile Backing Board: As recommended by backing panel manufacturer.

2.6 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
 - 1. Use adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
 - 1. Use screws complying with ASTM C 954 for fastening panels to steel members from **0.033 to 0.112 inch (0.84 to 2.84 mm)** thick.
 - 2. Sound Attenuation Blankets: As specified in Section 09 8100 "Acoustical Insulation".
 - 3. Fire-Resistance Rated Assemblies: As specified in Section 07 2100 "Thermal Insulation", Section 07 8413 "Penetration Firestopping", and Section 07 8446 "Fire-Resistive Joint Systems".
- D. Acoustical Sealant: As specified in Division 7 Section "Joint Sealants."
- E. Thermal Insulation: As specified in Division 7 Section "Thermal Insulation."
- F. Vapor Retarder: As specified in Division 7 Section "Thermal Insulation."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames and framing, for compliance with requirements and other conditions affecting performance.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.

- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than **1/16 inch (1.5 mm)** of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Where indicated on the Drawings, cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
 - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than **8 sq. ft. (0.7 sq. m)** in area.
 - 2. Fit gypsum panels around ducts, pipes, and conduits.
 - 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow **1/4- to 3/8-inch- (6.4- to 9.5-mm-)** wide joints to install sealant at STC-rated assemblies.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide **1/4- to 1/2-inch- (6.4- to 12.7-mm-)** wide spaces at these locations, and trim edges with edge trim where edges of panels are exposed. At STC-rated assemblies, seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

3.3 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
 - 1. Type X: Vertical surfaces, unless otherwise indicated.
 - 2. Flexible Type: Apply in double layer at curved assemblies.
 - 3. Ceiling Type: As indicated on Drawings.
 - 4. Abuse-Resistant Type: As indicated on Drawings.
 - 5. Moisture and Mold-Resistant type at all restrooms, janitor rooms, locker rooms, toilet rooms, and concession room unless otherwise shown.

B. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing, unless otherwise indicated.
2. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing), unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - b. At stairwells and other high walls, install panels horizontally, unless otherwise indicated or required by fire-resistance-rated assembly.
3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application:

1. On 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.
2. On Z-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.
3. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

D. Curved Surfaces:

1. Install panels horizontally (perpendicular to supports) and unbroken, to extent possible, across curved surface plus **12-inch- (300-mm-)** long straight sections at ends of curves and tangent to them.
2. For double-layer construction, fasten base layer to studs with screws **16 inches (400 mm)** o.c. Center gypsum board face layer over joints in base layer, and fasten to studs with screws spaced **12 inches (300 mm)** o.c.

3.4 APPLYING EXTERIOR GYPSUM PANELS FOR CEILINGS AND SOFFITS

- A. Apply panels perpendicular to supports, with end joints staggered and located over supports.
1. Install with **1/4-inch (6.4-mm)** open space where panels abut other construction or structural penetrations.
 2. Fasten with corrosion-resistant screws.

3.5 APPLYING WATER-RESISTANT PANELS

- A. Water-Resistant Gypsum Backing Board: Install at areas of the building where it's not feasible to wait until cladding is complete and where indicated. Install with **1/4-inch (6.4-mm)** gap where panels abut other construction or penetrations.

- B. Glass-Mat, Water-Resistant Backing Panel: Comply with manufacturer's written installation instructions and install at showers, tubs, and locations indicated to receive tile and where indicated. Install with **1/4-inch (6.4-mm)** gap where panels abut other construction or penetrations.
- C. Areas Not Subject to Wetting: Install regular-type gypsum wallboard panels to produce a flat surface except at showers, tubs, and other locations indicated to receive water-resistant panels.
- D. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.6 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.
- C. Interior Trim: Install in the following locations:
 - 1. Bullnose Bead: Use at outside corners.
 - 2. U-Bead: Use at exposed panel edges.
 - 3. Curved-Edge Cornerbead: Use at curved openings.
- D. Exterior Trim: Install in the following locations:
 - 1. Cornerbead: Use at outside corners.
 - 2. LC-Bead: Use at exposed panel edges.
- 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 and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
 - 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
 - 2. Level 2: Panels that are substrate for tile.
 - 3. Level 3: Where heavy wallcovering is installed.
 - 4. Level 4: Exposed surfaces in finished rooms and areas.
 - a. Primer and its application to surfaces are specified in other Division 9 Sections.

5. Level 5: For gypsum board surfaces to receive semi-gloss and gloss interior paint (for walls and ceilings in wet areas).
 - a. Primer and its application to surfaces are specified in other Division 9 Sections.
- E. For level 4 gypsum board finish, embed tape in joint compound and apply three separate coats of joint compound over joints, angles, fastener heads, and accessories. Touch up and sand between coats and after last coat as needed to produce a surface free of visual defects and ready for decoration. Use the following joint compound combination:
 1. Embedding and First Coat: Ready-mixed, drying-type, all-purpose or taping compound.
 2. Fill (Second) Coat: Ready-mixed, drying-type, all-purpose or topping compound.
 3. Finish (Third) Coat: Ready-mixed, drying-type, all-purpose or topping compound.
- F. Glass-Mat, Water-Resistant Backing Panels: Finish according to manufacturer's written instructions.

3.8 PROTECTION

- A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- B. Remove and replace panels that are wet, moisture damaged, and mold damaged.
 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

- END OF SECTION -

- SECTION 09 3013 -

CERAMIC TILE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Ceramic tile.
 - 2. Stone thresholds.
 - 3. Waterproof membrane.
 - 4. Crack isolation membrane.
 - 5. Tile backing panels.
 - 6. Metal edge strips.

1.3 RELATED SECTIONS

- A. Section 01 74 19 "Materials Recycling & Waste Management".
- B. Section 01 81 13 "LEED Certification Requirements".
- C. Section 07 9200 "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.
- D. Section 09 2900 "Gypsum Board" for glass-mat, water-resistant backer board.

1.4 DEFINITIONS

- A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.
- B. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17, which are contained in "American National Standard 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.

1.5 PERFORMANCE REQUIREMENTS

- A. Static Coefficient of Friction: For tile installed on walkway surfaces, provide products with the following values as determined by testing identical products per ASTM C 1028:
 - 1. Level Surfaces: Minimum Level Surfaces: Minimum 0.6.

1.6 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. LEED Submittal: See Section 018113 LEED Certification Requirements for the following:
 - 1. Product Data for Credit EQ 4.1: For adhesives and sealants, including printed statement of VOC content.
 - 2. MRc4 Recycled Content: Product data for products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content.
 - a. Include cost information for each product having recycled content.
 - 3. MRc5 Regional Materials:
 - a. Sourcing location(s): indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery from the project site.
 - b. Manufacturing location(s): indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
 - c. Product Value: indicate dollar value of product containing regional materials; include materials costs only.
 - d. Product Component(s) Value: Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.
- C. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.
- D. Samples for Initial Selection: For each type of tile and grout indicated. Include Samples of accessories involving color selection.
- E. Samples for Verification:
 - 1. Full-size units of each type and composition of tile and for each color and finish required.
 - 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 (300 mm) square, but not fewer than 4 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 (150-mm) lengths.
 - 5. Metal edge strips in 6-inch (150-mm) lengths.

CERAMIC TILE

- F. Qualification Data: For qualified Installer.
- G. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.
- H. Product Certificates: For each type of product, signed by product manufacturer.
- I. Material Test Reports: For each tile-setting and -grouting product and special purpose tile.

1.7 QUALITY ASSURANCE

- A. Source Limitations for Tile: Obtain tile from one source or producer.
 - 1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.
- B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from one manufacturer and each aggregate from one source or producer.
- C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer for each product:
 - 1. Stone thresholds.
 - 2. Waterproof membrane.
 - 3. Crack isolation membrane.
 - 4. Joint sealants.
 - 5. Glass-Mat, Water-Resistant backer units.
 - 6. Metal edge strips.
- D. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.
- B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.
- D. Store liquid materials in unopened containers and protected from freezing.
- E. Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

1.9 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

1.10 EXTRA MATERIALS

- 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.

PART 2 - PRODUCTS

2.1 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
 - 1. Provide tile complying with Standard grade requirements unless otherwise indicated.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCA installation methods specified in tile installation schedules, and other requirements specified.
- 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.
- E. Factory-Applied Temporary Protective Coating: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by precoating with continuous film of petroleum paraffin wax, applied hot. Do not coat unexposed tile surfaces.

2.2 TILE PRODUCTS

- A. Tile Type (CTB1): Built-up cover tile base.
 - 1. Product: Dal Tile; Keystones ColorBody Porcelain Tiles. No substitutions allowed.
 - 2. Face Size: 2 inches by 2 inches (50.8 by 50.8 mm).
 - 3. Thickness: 1/4 inch (6.4 mm).
 - 4. Tile Colors:
 - a. D311 Black

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5. Pattern: Refer to Drawings.
6. Grout Color: Bostick Findley, Hydroment S125/U210 Taupe 117.
7. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:
8. Built-up Base: Style MB-5A: Coved with surface bullnose top edge, face size: 2 inches by 2 inches (50 by 50 mm).

B. Glazed Wall Tile: ANSI A137.1, and as follows:

1. Product: Daltile Semi-Gloss, clear high gloss finish; moisture absorption 0.5 percent or less. No substitutions allowed.
2. Nominal Facial Dimensions: Various.
3. Face: Smooth with Cushioned Edges.
4. Nominal Thickness: 1/4 inch.
5. Trim Units: Matching bead, cove, and surface bullnose shapes in sizes coordinated with field tile
6. Tile Patterns: Refer to drawings, see 3/A5.11.
7. Grout Color: Bostick Findley, Hydroment S125/U210 Taupe 117.
8. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:
 - a. Field (CTW1): 0190 Arctic White.
 - 1) Size: 6 inch by 6 inch (152 x 152 mm)
 - b. Liners (CTW2): 0190 Arctic White.
 - 1) Size: 1 inch by 6 inch.
 - c. Accent (CTW3): 0190 Arctic White.
 - 1) Size: 6 inch by 6 inch (152 x 152 mm)
 - 2) Matte Finish.
 - d. Bullnose: 0190 Arctic White

C. Tile Type: Floor tile.

1. Product: Dal Tile; Keystones ColorBody Porcelain Tiles. No substitutions allowed.
2. Face Size: 2 inches by 2 inches (50 by 50 mm).
3. Thickness: 1/4 inch (6.4 mm).
4. Field Tile Colors:
 - a. D138 Golden Granite (10%)
 - b. D050 Mottled Medium Brown (65%)
 - c. D204 Artisan Brown Speckle (15%)
 - d. D311 Black (10%)
5. Tile Border: Color: D311 Black.
6. Grout Color: Bostick Findley, Hydroment S125/U210 Taupe 117.
7. Pattern: Randomly mixed in percentages indicated above.

8. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:
 - a. Field and border units.

2.3 STONE THRESHOLDS

- A. General: Provide stone (marble) that is uniform in color and finish, fabricated to sizes and profiles indicated or required to provide transition between tile surfaces and adjoining finished floor surfaces. Transition shall comply with ADA requirements.
- B. Marble Thresholds: Provide marble thresholds complying with ASTM C 503 requirements for exterior use and for abrasion resistance where exposed to foot traffic, a minimum hardness of 10 per ASTM C 241.
 1. Colors, Patterns, and Finishes: Crema Marfil.

2.4 TILE BACKING PANELS

- A. Refer to Section 09 2900 "Gypsum Board" for tile backing panels.

2.5 WATERPROOF MEMBRANE

- A. General: Manufacturer's standard product that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
- B. Chlorinated Polyethylene Sheet: Nonplasticized, chlorinated polyethylene faced on both sides with nonwoven polyester fabric; 0.030-inch (0.76-mm) nominal thickness.
 1. Products: Subject to compliance with requirements, provide the following:
 - a. Noble Company (The); Nobleseal TS.

2.6 CRACK-SUPPRESSION MEMBRANES FOR THIN-SET TILE INSTALLATIONS

- A. General: Manufacturer's standard product that complies with ANSI A118.10.
- B. Concrete Subfloors: Chlorinated-Polyethylene-Sheet Product: Nonplasticized, chlorinated polyethylene faced on both sides with high-strength, nonwoven polyester fabric, for adhering to latex-portland cement mortar; 60 inches (1524 mm) wide.
 1. Membrane: Minimum 30 mil thick load bearing membrane, capable of withstanding 1/4-inch horizontal structural crack and joint movement
 2. Self-adhering, pressure sensitive formulation is acceptable
 3. Basis of Design: Noble Company (The); Nobleseal TS.
 - a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) National Applied Construction Products, Inc.; ECB Membrane
 - 2) Protecto Wrap Company; Protecto Wrap.

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2.7 SETTING MATERIALS

- A. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Boiardi Products; a QEP company.
 - b. Bonsal American; an Oldcastle company.
 - c. Bostik, Inc.
 - d. C-Cure.
 - e. Custom Building Products.
 - f. Jamo Inc.
 - g. Laticrete International, Inc.
 - h. MAPEI Corporation.
 - i. Mer-Kote Products, Inc.
 - j. Southern Grouts & Mortars, Inc.
 - k. Summitville Tiles, Inc.
 - l. TEC; a subsidiary of H. B. Fuller Company.
 2. Provide prepackaged, dry-mortar mix combined with acrylic resin or styrene-butadiene-rubber liquid-latex additive at Project site.
 3. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4.

2.8 GROUT MATERIALS

- A. Standard Cement Grout: ANSI A118.6.
1. Basis-of-Design Product: Subject to compliance with requirements, provide products manufactured by Bostik, Inc.

2.9 ELASTOMERIC SEALANTS

- A. General: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer indicated that comply with requirements of Division 7 Section "Joint Sealers," including ASTM C 920 as referenced by Type, Grade, Class, and Uses.
- B. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints unless otherwise indicated.
- C. One-Part Mildew-Resistant Silicone Sealant: Type S; Grade NS; Class 25; Uses NT, G, A, and as applicable to nonporous joint substrates indicated, O; formulated with fungicide, intended for sealing interior ceramic tile joints and other nonporous substrates that are subject to in-service exposures of high humidity and temperature extremes.
- D. Products: Subject to compliance with requirements, provide one of the following:
1. One-Part Mildew-Resistant Silicone Sealant:
 - a. "Dow Corning 786"; Dow Corning Corp.
 - b. "SCS 1702"; General Electric Co.
 - c. "863 #345 White"; Pecora Corp.

- d. "Rhodorsil 6B White"; Rhone-Poulenc Inc.
- e. "Proglaze White"; Tremco Corp.

2.10 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.
- B. Metal Edge Strips: Angle or L-shape, height to match tile and setting-bed thickness; metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications, and stainless steel; ASTM A 666, 300 Series exposed-edge material with satin finish.
- C. 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.
- D. Grout Sealer: Manufacturer's standard silicone product for sealing grout joints and that does not change color or appearance of grout.
 - 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. Bonsal American; an Oldcastle company; Grout Sealer.
 - b. Bostik, Inc.; CeramaSeal Grout & Tile Sealer.
 - c. C-Cure; Penetrating Sealer 978.
 - d. Custom Building Products; Grout and Tile Sealer.
 - e. Jamo Inc.; Matte Finish Sealer.
 - f. MAPEI Corporation; KER 003, Silicone Spray Sealer for Cementitious Tile Grout.
 - g. Southern Grouts & Mortars, Inc.; Silicone Grout Sealer.
 - h. Summitville Tiles, Inc.; SL-15, Invisible Seal Penetrating Grout and Tile Sealer.
 - i. TEC; a subsidiary of H. B. Fuller Company; TA-257 Silicone Grout Sealer.

2.11 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
1. Verify that substrates for setting tile are firm, dry, clean, free of coatings that are incompatible with tile-setting materials including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
 2. Verify that concrete substrates for tile floors installed with bonded mortar bed or thin-set mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.
 - a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
 - b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.
 3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
 4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thin-set mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.
- B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped **1/4 inch per foot (1:50)** 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.
- D. Field-Applied Temporary Protective Coating: If indicated under tile type or needed to prevent grout from staining or adhering to exposed tile surfaces, precoat them with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

3.3 TILE INSTALLATION

- A. Comply with TCA's "Handbook for Ceramic Tile Installation" for TCA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.

1. For the following installations, follow procedures in the ANSI A108 Series of tile installation standards for providing 95 percent mortar coverage:
 - a. Tile floors in wet areas.
 - b. Tile floors composed of tiles **8 by 8 inches (200 by 200 mm)** or larger.
 - c. Tile floors composed 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. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
 1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
 2. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
 3. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.
- E. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
 1. Ceramic Mosaic Tile: 1/16 inch (**1.6 mm**).
 2. Glazed Wall Tile: 1/16 inch (**1.6 mm**).
 3. Decorative Thin Wall Tile: 1/16 inch (**1.6 mm**).
- F. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.
- G. 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.
 2. Prepare joints and apply sealants to comply with requirements in Division 7 Section "Joint Sealants."
- H. Stone Thresholds: Install thresholds at termination of floor tile or where exposed edge of tile flooring meets carpet, wood, or other dissimilar flooring material. Threshold finishes flush with top of tile; set in same type of setting bed as abutting field tile unless otherwise indicated.
 1. Set thresholds in latex-portland cement mortar for locations where mortar bed would otherwise be exposed above adjacent non-tile floor finish.
- I. 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.

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- J. Grout Sealer: Apply grout sealer to cementitious grout joints in tile floors according to grout-sealer manufacturer's written instructions. As soon as grout 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. Refer to Section 09 2900 "Gypsum Board" for installation of tile backing panels.

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 and bonded securely to substrate.
- B. Do not install tile or setting materials over waterproofing until waterproofing has cured and been tested to determine that it is watertight.

3.6 CRACK ISOLATION MEMBRANE INSTALLATION

- A. Install crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness and bonded securely to substrate.
- B. Do not install tile or setting materials over crack isolation membrane until membrane has cured.

3.7 CLEANING AND PROTECTING

- A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
 - 1. Remove latex-portland cement grout residue from tile as soon as possible.
 - 2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
 - 3. Remove temporary protective coating by method recommended by coating manufacturer and that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent drain clogging.
- B. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.
- C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.
- D. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.8 FLOOR INSTALLATION METHODS

- A. Floor Tile: Install tile to comply with requirements indicated below for setting bed methods, TCA installation methods related to types of subfloor construction, and grout types:
 - 1. Portland Cement Mortar: ANSI A108.1
 - 2. Waterproofing Membrane: ANSI A118.10.
 - 3. Bond Coat: Latex-portland cement mortar, ANSI A108.1A or ANSI A108.5.
 - 4. Concrete Slab On Grade, Interior at Restrooms (sloped mortar bed): TCA F112-05 (with tile installed by Method F115-03 on cured bed).
 - 5. Concrete Slab on Grade, Interior, TCA F122, dry-set or latex Portland cement bond coat, with standard grout, unless otherwise indicated.
 - a. Where waterproofing membrane is indicated, install in accordance with TCA F122, with latex-portland cement grout.
 - 6. Concrete Elevated Subfloors, Interior at Restrooms (sloped mortar bed over membrane): TCA F121-07 (with tile installed by Method F115-07 on cured bed).
 - 7. Grout: Standard sanded cement.
- B. Stone Thresholds: Install stone thresholds at termination of floor tile or where exposed edge of tile flooring meets carpet, wood, or other dissimilar flooring material. Threshold finishes flush with top of tile; set in same type of setting bed as abutting field tile unless otherwise indicated.
 - 1. Set thresholds in latex-portland cement mortar for locations where mortar bed would otherwise be exposed above adjacent nontile floor finish.
- C. Expansion Joints: TCA EJ171-03.

3.9 WALL TILE INSTALLATION METHODS

- A. Install types of tile designated for wall application to comply with requirements indicated below for setting-bed methods, TCA installation methods related to subsurface wall conditions, and grout types:
 - 1. Latex-Portland Cement Mortar: ANSI A108.6.
 - 2. Wet Areas, Interior (thinset): TCA W245-07 over water-resistant gypsum.
 - 3. Dry Areas, Interior (thinset): TCA W243-07.
 - 4. Grout: Standard sanded cement.

- END OF SECTION -

- SECTION 09 5113 -

ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Acoustical panels and suspended exposed grid ceiling system.
- B. Products Furnished But Not Installed Under This Section: Anchors or inserts for suspension system.

1.3 RELATED SECTIONS

- A. Section 01 74 19 "Materials Recycling & Waste Management".
- B. Section 01 81 13 "LEED Certification Requirements".
- C. Section 09 5426 "Linear Wood Ceilings" for linear wood ceilings.
- D. Division 23 "Mechanical" for work to be coordinated with ceiling.
- E. Division 26 "Electrical" for light fixture coordination.

1.4 REFERENCES

- A. ASTM C 635 – Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
- B. ASTM C 636 – Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.
- C. ASTM A 641 – Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
- D. ASTM E 84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
- E. ASTM E 580 – Standard Practice for Application of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Requiring Seismic Restraint.

- F. ASTM E 1264 – Standard Classification for Acoustical Ceiling Products.
- G. CISCA – Ceilings and Interior Systems Construction Association, "Guidelines for Seismic Restraint of Direct-Hung Suspended Ceiling Assemblies".
- H. UBC. Standard No. 25-2, "Metal Suspension Systems for Acoustical Tile and for Lay-In Panel Ceilings."

1.5 SYSTEM REQUIREMENTS

- A. Interface With Other Systems: Coordinate layout and installation of acoustical ceiling units and suspension system components with other work supported by, or penetrating through, ceilings, including but not limited to light fixtures, HVAC equipment, Laboratory Equipment, partition systems, and casework.

1.6 SUBMITTALS

- A. Product Data: Submit product data for each acoustical material and suspension system component.
- B. LEED Submittals: See Section 018113 LEED Certification Requirements for the following:
 - 1. Product Data for Credit MR 4.1 and MR 4.2: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
 - a. Include statement indicating costs for each product having recycled content.
 - 2. MRc5 Regional Materials:
 - a. Sourcing location(s): indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery from the project site.
 - b. Manufacturing location(s): indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
 - c. Product Value: indicate dollar value of product containing regional materials; include materials costs only.
 - d. Product Component(s) Value: Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.
 - 3. EQc4.1 Adhesives & Sealants: Product data for adhesives & sealants, including printed statement of VOC content and chemical components.
- C. Samples:
 - 1. Submit samples of each acoustical ceiling unit and exposed suspension component specified for review of color and texture.
 - 2. Show full range of texture and color expected in completed Work in each sample submission.
 - 3. Panel: Submit 12-inch by 12-inch samples of each type.
 - 4. Exposed Tees and Moldings: Submit one-foot lengths of each type suspension system, including moldings.

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1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in acoustical ceiling work having minimum of 3-years successful documented experience with work comparable to that indicated and specified.
- B. Regulatory Requirements: Conform to local code for combustibility requirements for materials.
 - 1. Panel units shall be Class A rated per ASTM E 1264 (25 or under flame spread and 50 or under smoke developed ratings tested in accordance with ASTM E 84), or Flame Spread Classification (Class I), per CBC Table 8-A.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, handle, and protect products in accordance with manufacturer's instructions.

1.9 ENVIRONMENTAL REQUIREMENTS

- A. Permit acoustical materials to reach room temperature and a stabilized moisture content before installation.
- B. Maintain uniform temperature of minimum 60-degrees F and humidity of 20-percent to 40-percent prior to, during, and after installation.

1.10 SEQUENCING

- A. Do not install interior acoustical ceilings until space is enclosed and weatherproof, wetwork in space is completed and nominally dry, and work above ceilings is complete.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. Manufacturers:
 - 1. Acoustic Tile:
 - a. USG Interiors, Inc., Chicago, IL., Tel: (800) 964-4874, contact: Armando Diaz, Web: www.usg.com
 - b. Armstrong World Industries, Inc., Lancaster, PA., Tel: (650) 685-1654, contact: Liesl Heil Morell, Web: www.armstrong.com
 - c. Celotex, a Division of BPB, Tampa, FL, Tel: (925) 963-4945, contact: Richard Green, Web: www.bpb-na.com
 - d. Or equal
 - 2. Suspension System:
 - a. USG Interiors, Inc., Chicago, IL, Tel: (800) 964-4874, contact: Armando Diaz, Web: www.usg.com
 - b. Armstrong World Industries, Inc., Lancaster, PA., Tel: (650) 685-1654, contact: Liesl Heil Morell, Web: www.armstrong.com
 - c. Chicago Metallic, Chicago, IL, Tel: (408) 607-2585, contact: Jason Cottone, Web: www.chicagometallic.com

- d. Or equal.

2.2 MINERAL-BASE PANELS - WATER FELTED

- A. Products: Subject to compliance with requirements, provide the following:
1. Mineral Base Panels, Water Felted, with Painted Finish and Smooth and Perforated Pattern, Fire-Resistance Rated. Panel Characteristics Type III, Form 1 units per ASTM E 1264, with pattern designation E,G, with other panel characteristics as follows
 - a. Mineral Base Panels: Water Felted, with Painted Finish and Fine Textured Pattern. Color: White.
 - 1) Panel: "Millenia ClimaPlus Illusion Two/24 Panels", by USG Interiors, Inc. (#78780).
 - 2) Size: 24 inches by 48 inches by 3/4-inch.
 - 3) Grid: Donn DX /DXL Suspension System 15/16" wide.
 - 4) Edge Detail: Shadowline Tapered.
 - 5) NRC Range: 0.70.
 - 6) CAC Range: 35.
 - 7) LR: .85.
 - 8) Warranty: Manufacturer's Lifetime 30 year warranty.
 2. Mineral Base Panels, Water Felted, with Painted Finish and Smooth and Perforated Pattern. Panel Characteristics Type III, Form 2 units per ASTM E 1264, with pattern designation C,D,E, with other panel characteristics as follows
 - a. Mineral Base Panels: Water Felted, with Painted Finish. Color: White.
 - 1) Panel: "Radar", USG Interiors, Inc. (#2311), or equal.
 - 2) Size: 24 inches by 48 inches by 3/4 inch
 - 3) Grid: Donn DX/DXL Suspension System 15/16" wide
 - 4) Edge Detail: Square Edge.
 - 5) NRC: 0.60.
 - 6) CAC Min: 35.
 - 7) LR: 0.85
 - 8) Recycled content: Not less than 28.
 - 9) Warranty: Manufacturer's Lifetime 30 year warranty.
 3. Gypsum Core, Vinyl Faced, smooth and unperforated. Panel Characteristics Type XX, Form XX units per ASTM E 1264, with pattern designation G, with other panel characteristics as follows
 - a. Gypsum Core, Vinyl Faced, smooth and unperforated. Color: White.
 - 1) Panel: "Sheetrock Brand Lay-In Ceiling Tile ClimaPlus", USG Interiors, Inc. (#3270), or equal.
 - 2) Size: 24 inches by 48 inches by 1/2 inch
 - 3) Grid: Donn DX/DXL Suspension System 15/16" wide
 - 4) Edge Detail: Square Edge.
 - 5) NRC: Not less than in accordance with ASTM C423. Product to have UL acoustical compliance.
 - 6) CAC Min: 40.
 - 7) LR: 0.77

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- 8) Recycled content: Not less than 23.
- 9) Warranty: Manufacturer's 15 year warranty.

2.3 METAL SUSPENSION SYSTEMS, GENERAL

- A. Exposed Suspension System:
1. Grid: ASTM C635, intermediate duty, exposed T; interlocking components designed to resist seismic lateral pullout.
 2. Grid Materials: Cold-rolled steel with galvanized coating.
 3. Grid Finish: White baked-on enamel.
 4. Acceptable Product: "Donn DX/DXL" by USG Interiors, Inc., Chicago, IL, Tel: (800) 964-4874, Web: www.usg.com.
- B. Suspension System Accessories:
1. Manufacturer's standard trim and edge moldings to suit suspension system requirements; same finish as suspension system.
 2. Provide edge moldings to fit penetrations exactly, including circular penetrations.
 3. Provide hold-down clips required for suspended grid system, where recommended by manufacturer.

2.4 ACCESSORIES

- A. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
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 per ASTM E 488 or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency.
 - a. Type: Postinstalled expansion anchors.
 - b. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (0.005 mm) for Class SC 1 service condition.
 - c. Corrosion Protection Nickel-Copper-Alloy Wire: ASTM B 164, nickel-copper-alloy UNS No. N04400, in high humidity areas.
 2. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated, and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing per ASTM E 1190, conducted by a qualified testing and inspecting agency.
 - a. Verify with Structural Drawing General Notes to verify this method of attachment is acceptable.
- B. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
 2. Nickel-Copper-Alloy Wire: ASTM B 164, nickel-copper-alloy UNS No. N04400.

3. Size: Select wire diameter so its stress at 3 times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.135-inch- (3.5-mm-) diameter wire.
- C. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.
- D. Angle Hangers: Angles with legs not less than 7/8 inch (22 mm) wide; formed with 0.04-inch- (1-mm-) thick, galvanized steel sheet complying with ASTM A 653/A 653M, G90 (Z275) coating designation; with bolted connections and 5/16-inch- (8-mm-) diameter bolts.
- E. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.
- F. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.
- G. Seismic Clips: Manufacturer's standard seismic clips designed and spaced to secure acoustical panels' in-place.
- H. Hold-Down Clips: Where indicated, provide manufacturer's standard hold-down clips spaced 24 inches (610 mm) o.c. on all cross tees.

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 with requirements for installation tolerances and other conditions affecting performance of acoustical tile ceilings.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical tiles to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width tiles at borders, and comply with layout shown on reflected ceiling plans.
- B. Where work points shown on drawings, start grid layout at work point and proceed in complete modules radially from the work point to the edges of the ceiling.

3.3 SUSPENDED CEILING INSTALLATION

- A. General: Install acoustical panel ceilings to comply with publications referenced below per manufacturer's instructions and CISCA "Ceiling Systems Handbook".
 1. Install system in accordance with ASTM C 636, except for more stringent requirements of manufacturer or these specifications.

ACOUSTICAL PANEL CEILINGS

2. Standard for Ceiling Suspension Systems Requiring Seismic Restraint: Comply with ASTM E 580.
 3. CISCA Guidelines for Systems Requiring Seismic Restraint: Comply with CISCA "Guidelines for Seismic Restraint of Direct-Hung Suspended Ceiling Assemblies."
 4. UBC. Standard No. 25-2, "Metal Suspension Systems for Acoustical Tile and for Lay-In Panel Ceilings."
- B. Install system capable of supporting imposed loads with maximum deflection of 1/360.
- C. Hanger Installation:
1. Coordinate location of hangers with other work.
 2. Secure hangers or rods as required to structural support by connecting directly to structure where possible, otherwise connect to inserts, clips or other anchorage devices or fasteners.
 3. Space hangers not more than 6-inches from each ceiling edge.
 - a. Provide sufficient additional hangers for support of fixtures and other items supported by ceiling suspension system to prevent eccentric deflection or rotating of supporting runners. Provide hangers on cross-runners within 6 inches of grid intersections to support light fixtures.
 4. Hang system independent of columns, ducts, pipes, and conduit.
 5. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
 6. If ducts of other equipment prevent the regular spacing of hangers, reinforce nearest affected hangers to span extra distance.
 7. Where building expansion joints occur, provide non-continuous independent suspension support on each side of joint. Bridge joint with expansion joint trim.
- D. Center system on room axis leaving equal border units, unless otherwise shown.
- E. Edge Molding Installation:
1. Install edge moldings where ceilings abut walls, partitions or other penetration elements.
 2. Miter cut inside and outside corners to provide flush, tight, hairline joints.
- F. Panel Installation:
1. Install in level and uniform plane; free from twist, warp and dents.
 2. Rest edges on flanges of tees.
 3. Support perimeters on wall moldings.
 4. Neatly scribe and cut boards for accurate fit at borders, interruptions, and penetrations by other work.
 5. Lay directional patterned units one way with pattern parallel to longest room axis.
- G. Site Tolerances:
1. Level completed assembly to tolerance of 1/8-inch in 10-feet.
 2. Variation from Plumb of Grid Members Caused by Eccentric Loads: Two degrees maximum.
- H. Penetrations
1. Center ceiling mounted devices and penetrations.

2. At exposed penetrations provide escutcheon.

3.4 CLEANING

- A. Clean exposed surfaces of exposed metal ceiling grid, trim, and edge moldings. Comply with manufacturers' instructions for cleaning and touchup of minor finish damage.
- B. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage, including dented and bent units.
- C. Clean exposed surfaces of acoustical tile ceilings, including trim and edge moldings. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace tiles and other ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

- END OF SECTION -

- SECTION 09 5426 -

LINEAR WOOD 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. Concealed suspension system for Acoustic Wood members.
 - 2. Wood grille ceiling panels for concealed suspension system.
 - 3. Trim and accessories.
 - 4. Seismic restraints for suspended ceiling system.

1.3 RELATED WORK

- A. Section 01 74 19 "Materials Recycling & Waste Management".
- B. Section 01 81 13 "LEED Certification Requirements".
- C. Section 09 5113 "Acoustic Panel Ceilings" for ceilings consisting of mineral-base and glass-fiber-base acoustical panels and exposed suspension systems.
- D. Division 23 "Mechanical" for work to be coordinated with ceiling.
- E. Division 26 "Electrical" for light fixture coordination.

1.4 REFERENCES

- A. ASTM A 641: Standard Specification for Zinc Coated (Galvanized) Carbon Steel Wire; 1992.
- B. ASTM C 423: Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method; 1990.
- C. ASTM C 635: Standard Specifications for Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings.
- D. ASTM C 636: Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels; 1992.

- E. ASTM E 84: Standard Test Method for Surface Burning Characteristics of Building Materials; 1991.
- F. ASTM E 580: Standard Practice for Application of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Requiring Seismic Restraint; 1991.
- G. AWI (QSI): Architectural Woodwork Quality Standards Illustrated; 2003.
- H. CISCA: Ceiling Systems Handbook.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturers other than those listed in Paragraph 2.1 are required to submit for approval prior to bidding per Section One.
- B. Installer Qualifications: Engage an experienced Installer, approved by wood ceiling manufacturer, who has completed panel ceilings similar in species, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- C. Inspection: All work must pass inspection and approval of architect, as well as the local codes and regulations or authorities having jurisdiction.
- D. Single-Source Responsibility for Wood Ceiling System: Obtain each type of Acoustic Wood members from a single fabricator, with in-house Shop Drawing capabilities, in-house assembly and finishing capabilities, and with resources to provide products of consistent quality in appearance and physical properties without delaying the project.
- E. Single-Source Responsibility for Suspension System: Obtain each type of suspension system from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying project.
- F. Pre-Installation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings."
- G. Forest Certification: Provide wood grilles produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."

1.6 SUBMITTALS

- A. General: Submit each item in this Section according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data: For each type of product specified.
- C. Samples: For verification of each type of exposed finish required, prepared on samples of size indicated below. Where finishes involve normal color and texture variations, include sample sets showing the range of variations expected.
 - 1. 12" x 18" samples of each panel type, pattern, and color.

- D. LEED Submittals: See Section 018113 LEED Certification Requirements for the following:
1. Product Data for Credit EQ 4.4:
 - a. For each composite-wood product used, documentation indicating that the bonding agent contains no urea formaldehyde.
 - b. For each adhesive used, documentation indicating that the adhesive contains no urea formaldehyde.
 2. Product Data for Credit(s) MR 4.1 and MR 4.2: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content
 - a. Include statement indicating costs for each product having recycled content.
 3. Certificates for Credit MR 7: Chain-of-custody certificates certifying that products specified to be made from certified wood comply with forest certification requirements. Include evidence that mill is certified for chain of custody by an FSC-accredited certification body.
 - a. Include statement indicating costs for each certified wood product.
 4. MRc5 Regional Materials:
 - a. Sourcing location(s): indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery from the project site.
 - b. Manufacturing location(s): indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
 - c. Product Value: indicate dollar value of product containing regional materials; include materials costs only.
 - d. Product Component(s) Value: Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.
- E. Shop Drawings & Coordination With Other Trades
1. Coordination Drawings: Reflected Ceiling Plans, Drawn To Scale, On Which The Following Items Are Shown And Coordinated With Each Other, Using Input From Installers Of The Items Involved:
 - a. Linear pattern.
 - b. Joint pattern.
 - c. Ceiling suspension members.
 - d. Method of attaching hangers to building structure.
 - 1) Furnish layouts for cast-in-place anchors, clips, and other ceiling attachment devices whose installation is specified in other Sections.
 - e. Ceiling-mounted items including light fixtures, diffusers, grilles, speakers, sprinklers, and access panels.
 - f. Ceiling perimeter and penetrations through ceiling; trim and moldings.

1.7 PROJECT CONDITIONS

- A. Space Enclosure and Environmental Limitations: Do not install wood panel ceilings until spaces are enclosed and weatherproof, wet-work in spaces is completed and dry, work above ceilings is complete and ambient temperature and humidity conditions are being maintained at the levels indicated for Project when occupied for its intended use.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Delivery & Unloading: Coordinate crate sizes, weights, unloading options, and delivery schedule with manufacturer prior to fabrication. Deliver wood panels and suspension system components to Project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other mistreatment.
- B. Climatization: Before installing wood panels, permit them to reach room temperature and stabilized moisture content (at least 72 hours) per AWI standards.
- C. Handling: Handle Acoustic Wood members carefully to avoid chipping edges or damaging units in any way.

1.9 EXTRA MATERIALS

- A. Extra Materials: Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels clearly describing contents.
 - 1. Acoustic Wood members: Furnish quantity of full-size units equal to 2.0 percent of amount installed.
 - 2. Suspension System Components: Furnish quantity of each component equal to 2.0 percent of amount installed.

1.10 WARRANTIES

- A. Warranties: Provide owner with a (1) year warranty for material and workmanship on all installed products.
 - 1. Manufacturers: All materials, wood ceiling and grid, shall be warranted for (1) one year for material and workmanship.
 - 2. Installer: All work shall be warranted for (1) year from final acceptance of completed work.

PART 2 - PRODUCTS

2.1 WOOD GRILLE CEILING PANELS

- A. Basis of Design: 9Wood, Inc. Acoustic Wood, Wood Grille, 1100 Series.
 - 1. Wood Grille Ceiling Panels:
 - a. Species: White Fir.

LINEAR WOOD CEILINGS

- b. Member Size: 5/8 inch by 2-1/4 inch.
- c. Edge Profile: Square
- d. Members/LF: 6 Members per LF
- e. Assembly Style: Cross Piece Backer.
- f. Fire Rating: Fire Rating Class, e.g., Class 1(A) Fire Rating.
- g. Finish: Pre-catalyzed lacquer, Satin Sheen, Clear Finish.

2.2 METAL SUSPENSION SYSTEMS, GENERAL

- A. Metal T-Grid Suspension System: Provide standard interior Metal Heavy Duty 15/16" suspension T-Grid system using Main Runners, Cross-tees, Wall Angle or Shadow Mouldings of types, structural classifications, and <black> finishes indicated and that comply with applicable ASTM C 635 requirements. Comply with all applicable <seismic> codes and ordinances.
- B. Attachment Devices: Size for 3 times the design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.
- C. Wire, Braces, Ties, Hanger Rods, Flat Hangers and Angle Hangers: Provide wires, rods and hangers that comply with applicable ASTM specifications.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. General: Examine substrates and structural framing to which ceilings attach or abut, with installer present, for compliance with requirements specified in this and other sections that affect ceiling installation and anchorage. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Coordination: Furnish layouts for cast-in-place anchors, clips, and other ceiling anchors whose installation is specified in other Sections.
- B. Layout: Measure each ceiling area and establish the layout of Acoustic Wood members to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and conform to the layout shown on reflected ceiling plans in accordance with wood ceiling manufacturer's approved Shop Drawings.

3.3 INSTALLATION

- A. General: Install Wood Grille Ceilings to comply with manufacturer's instructions and CISCA "Ceiling Systems Handbook."
- B. Attachments: Suspend ceiling hangers from building's structural members per manufacturer's instructions and in compliance with all local codes and regulations.

- C. Installation of Metal T-Bar Grid: Install, align, brace, tie-off, mount, handle interferences, and space suspension T-Grid in accordance with suspension manufacturer's instructions and in compliance with all local codes and regulations.
- D. Installation of Wood Grille: Install Wood ceiling members in accordance with manufacturer's installation instructions and in compliance with all local codes and regulations. Install with undamaged edges and fitted accurately to suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit, as required.
- E. Suspension Runners: Install suspension system runners so they are square and securely interlocked with one another. Install number and use on-center spacing per wood ceiling manufacturer's instructions, as indicated on approved Shop Drawings and in compliance with all local codes.

3.4 CLEANING

- A. General: Comply with manufacturer's instructions for cleaning and touchup of minor finish damage. Remove and replace wood ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

- END OF SECTION -

- SECTION 09 6000 -**SOUND TRANSMISSION CONTROL MATERIALS**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Rebonded recycled rubber underlayment.

1.3 RELATED SECTIONS

- A. Section 01 74 19 "Materials Recycling & Waste Management".
- B. Section 01 81 13 "LEED Certification Requirements".
- C. Section 03 3000 "Cast-in-Place Concrete" for concrete substrates.
- D. Section 09 6466 "Wood Athletic Flooring".

1.4 SUBMITTALS

- A. General: Submit following items in accordance with Section 01 3219.
- B. Product Data: Submit product data for each product.
- C. LEED Submittals: See Section 018113 LEED Certification Requirements for the following:
 - 1. Product Data for Credit MR 4.1 and MR 4.2: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
 - a. Include statement indicating costs for each product having recycled content.
 - 2. MRc5 Regional Materials:
 - a. Sourcing location(s): indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery from the project site.
 - b. Manufacturing location(s): indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.

- c. Product Value: indicate dollar value of product containing regional materials; include materials costs only.
 - d. Product Component(s) Value: Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.
3. EQc4.1 Adhesives & Sealants: Product data for adhesives & sealants, including printed statement of VOC content and chemical components.
- D. Shop Drawings: Manufacturers specifications, catalog cuts and other items needed to demonstrate compliance with the specified requirements. Also include the manufacturer's recommended installation procedures, which, when approved by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the work.
- E. Samples: Submit a verification sample.

1.5 PROJECT CONDITIONS

- A. Temperature Requirements: Maintain air temperature in spaces where products will be installed for time period before, during and after installation as recommended by manufacturer.
- B. Field Measurements: Verify actual measurements/opening by field measurements before fabrication. Show recorded measurements on shop drawings. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.
- C. Coordinate with work as specified in Section 03 3000 "Cast-in-Place Concrete".

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design: The design based on Regupol-QTscu Rebonded Recycled Rubber Impact Sound Insulation by Dodge-Regulol Inc. Lancaster, PA tel (866) 326-5712, www.regupolqt.com.

2.2 MATERIALS

- A. Rebonded Recycled Rubber Impact Sound Insulation, thickness 3/8 inch (10 mm).
- B. Roll Dimension: 48 inches (1219 mm) x 15 feet (4572 mm).
- C. Product Testing:
 - 1. Laboratory Impact Insulation Class (ASTM E 492): Specified floor-ceiling assembly must be tested in a NVLAP certified laboratory and comply with ASTM standards.
 - 2. Field Impact Insulation Class ASTM E 1007): Floor-ceiling assembly must meet requirement as stated by building code and/or acoustical consultant.
 - 3. Shall be ICC-ES certified.
 - 4. Shall be UL listed.

SOUND TRANSMISSION CONTROL MATERIALS

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions and proceed with Work when substrates are ready.
- B. Verify that substrate work is complete, clean, dry and installed in accordance with contract documents before beginning installation of sheet products.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions.
- 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 floor covering adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
 - 4. Moisture Testing: Perform tests recommended by manufacturer and as follows. Proceed with installation only after substrates pass testing.
 - a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 5 lbs of water/1000 sq. ft. (2.4 kg of water/92.9 sq. m) in 24 hours.
 - b. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have maximum 75 percent relative humidity level measurement.
- C. Grind high spots and fill low spots on concrete substrates to produce a maximum 1/8-inch (3-mm) deviation in any direction when checked with a 10-foot (3-m) straight edge.
 - 1. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, and depressions in substrates.
- D. Remove coatings, including curing compounds, and other substances on substrates that are incompatible with installation adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
- E. Broom or vacuum clean substrates to be covered immediately before product installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION

- A. Comply with manufacturers technical manual for procedures and techniques for installation.

- B. Concrete floor shall be fully cured and permanently dry. Subfloor shall be dry, clean, smooth, level and structurally sound. It should be free of dust, solvent, paint, wax, oil, grease, asphalt, sealers, curing and hardening compounds, alkaline salts, and other extraneous materials, according to ASTM F 710.

3.4 PROTECTION

- A. Protect sheets from puncture during installation. Patch punctures before proceeding with subsequent construction.

3.5 SCHEDULE

- A. Install beneath wood athletic flooring and other locations as indicated on Drawings.

- END OF SECTION -

- SECTION 09 6340 -

STONE 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 the following applications of dimension stone:
 - 1. Stair treads and risers.

1.3 RELATED SECTIONS:

- A. Division 07 Section "Joint Sealants" for sealing control and expansion joints in stonework with elastomeric sealants.

1.4 SUBMITTALS

- A. Product Data:
 - 1. For each variety of stone. Include data on physical properties required by referenced ASTM standards.
 - 2. For stone accessories and other manufactured products.
- B. LEED Submittal:
 - 1. Product Data for Credit EQ 4.1: For adhesives, including printed statement of VOC content.
- C. Shop Drawings: Include plans, sections, details, and attachments to other work.
- D. Samples for Initial Selection: For joint materials involving color selection.
- E. Samples for Verification:
 - 1. For each stone type indicated, in sets of Samples not less than 12 inches (300 mm) square. Include four or more Samples in each set and show the full range of variations in appearance characteristics expected in completed Work. Samples will establish the standard by which stone will be judged.

- F. Qualification Data: For qualified fabricator.
- G. Maintenance Data: For stone flooring 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.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: A qualified fabricator that custom fabricates stone.
- B. Installer Qualifications: Stone fabricator.
- C. Source Limitations for Stone: Obtain each variety of stone, regardless of finish, from a single quarry 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 quarried blocks available for examination by Architect for appearance characteristics.
 - 3. Make stone slabs available for Architect to examine for appearance characteristics.
 - 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.
- D. Source Limitations for Other Materials: Obtain each type of cementitious material, grout, admixture, stone accessory, and other material from single source.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. 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.
- B. Store stone on wood A-frames or pallets with nonstaining separators and nonstaining, waterproof covers. Ventilate under covers to prevent condensation.
- C. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

1.7 PROJECT CONDITIONS

- A. Cold-Weather Requirements for Interior Stone Flooring:
 - 1. Do not set stone when air or material temperature is below 50 deg F (10 deg C).
 - 2. Maintain temperature at 50 deg F (10 deg C) or above in installation areas during installation and for 7 days after completion unless higher temperatures are required by fabricator's or supplier's instructions.

PART 2 - PRODUCTS

2.1 SLATE

- A. Slate: Comply with ASTM C 629, Classification I Exterior, with a fine, even grain and unfading color, from clear, sound stock.
 - 1. Products: Subject to compliance with requirements, provide the following:
 - a. Slate type as selected by Architect.
 - b. Emser Tile, Los Angeles, CA, tel: (323) 650-2000, website: www.emser.com.
 - 2. Color Range: Medium to Dark Gray to be selected by Architect.
 - 3. Stone Abrasion Resistance: Minimum value of 8, based on testing according to ASTM C 241 or ASTM C 1353.
- B. Finish: Match Architect's sample.
- C. Match Architect's samples for color, finish, and other stone characteristics relating to aesthetic effects.
- D. Thickness: Not less than 1-1/2 inch (38 mm) unless otherwise indicated.

2.2 MORTAR MATERIALS

- A. Thin-Set Mortar:
 - 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. Boiardi Products Corporation.
 - b. Bonsal.
 - c. Bostik Findley Inc.
 - d. C-Cure.
 - e. Custom Building Products.
 - f. DAP Inc.
 - g. Laticrete International, Inc.
 - h. MAPEI Corp.
 - i. Summitville Tiles, Inc.
 - j. TEC Specialty Construction Brands; H. B. Fuller Company.
 - 2. Latex-Portland Cement Mortar: ANSI A118.4, consisting of the following:
 - a. Mixture of Dry-Mortar Mix and Latex Additive: Mixture of prepackaged dry-mortar mix and styrene-butadiene-rubber or acrylic-resin liquid-latex additive.
- B. Water: Potable.

2.3 ACCESSORIES

- A. Abrasive Inserts for Stair Treads: Abrasive strips consisting of aluminum oxide, silicon carbide, or a combination of both, in an epoxy-resin binder, fabricated for installing in routed grooves of

stair treads to provide slip resistance. Provide epoxy-resin installation adhesive compatible with inserts.

1. Width: 2 inches (50.8 mm).
 2. Depth: As indicated.
 3. Length: As indicated.
- B. Cleaner: Stone cleaner specifically formulated for stone types, finishes, and applications indicated, as recommended by stone producer and, if a sealer is specified, by sealer manufacturer. Do not use cleaning compounds containing acids, caustics, harsh fillers, or abrasives.
- C. Floor Sealer: Colorless, slip- and 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 Findley Inc.
 - b. Custom Building Products.
 - c. Hillyard, Inc.
 - d. HMK Stone Care System.
 - e. Miracle Sealants Company.
 - f. Stonecare International.
 - g. Summitville Tiles, Inc.

2.4 MORTAR MIXES

- A. Mortar: Comply with referenced standards and with manufacturers' written instructions for mix proportions, mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures needed to produce mortar of uniform quality and with optimum performance characteristics.
1. Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated. Do not use calcium chloride.
 2. Combine mortar materials and thoroughly mix in a mechanical batch mixer unless otherwise indicated. Discard mortar when it has reached initial set.
- B. Latex-Modified Portland Cement Setting Mortar: Proportion and mix portland cement, aggregate, and latex additive to comply with latex-additive manufacturer's written instructions and to produce a stiff mixture with a moist surface when bed is ready to receive stone.
- C. Mortar-Bed Bond Coat: Mix neat cement and latex additive to a creamy consistency.
- D. Latex-Modified Portland Cement Bond Coat: Proportion and mix portland cement, aggregate, and latex additive to comply with latex-additive manufacturer's written instructions.

2.5 STONE FABRICATION

- A. Select stone for intended use to prevent fabricated units from containing cracks, seams, and starts that could impair structural integrity or function.

STONE FLOORING

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. Fabricate stone to comply with requirements indicated and with the following references:
 1. For stone not otherwise indicated, comply with recommendations in MIA's "Dimension Stone - Design Manual."
- C. Fabricate stone stair treads in sizes and profiles indicated. Rout grooves into treads to receive abrasive strips and install strips to comply with manufacturer's written directions.
- D. Carefully inspect finished stone units at fabrication plant for compliance with requirements for appearance, material, and fabrication. Replace defective units. Clean sawed backs of stones to remove rust stains and iron particles.
 1. Grade and select stone for overall uniform appearance when assembled in place.
 2. Natural variations in appearance are acceptable if installed stone units match range of colors and other appearance characteristics represented in approved Samples.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces indicated to receive stone, with Installer present, for compliance with requirements and other conditions affecting performance.
- B. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of stone flooring.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Sweep concrete substrates to remove dirt, dust, debris, and loose particles.
- B. Remove substances from concrete substrates that could impair mortar bond, including curing and sealing compounds, form oil, and laitance.
- C. Clean dirty or stained stone surfaces by removing soil, stains, and foreign materials before setting. Clean stone by thoroughly scrubbing with fiber brushes and then drenching with clear water. Use only mild cleaning compounds that contain no caustic or harsh materials or abrasives.

3.3 INSTALLATION, GENERAL

- A. Do necessary field cutting as stone is set. Cut lines straight and true and finish field-cut edges to match shop-cut edges.
 1. Use power saws with diamond blades to cut stone.

- B. Set stone to comply with Drawings and Shop Drawings.
- C. Scribe and field-cut stone as necessary to fit at obstructions. Produce neat joints of size specified or indicated.
- D. Expansion- and Control-Joint Installation: Locate and install according to Drawings and Shop Drawings.

3.4 INSTALLATION TOLERANCES

- A. Variation in Line: For positions shown in plan for edges of paving, flooring, ramps, steps, changes in color or finish, and continuous joint lines, do not exceed **1/8 inch in 96 inches (3 mm in 2400 mm)**, **1/4 inch in 20 feet (6 mm in 6 m)**, or **3/8 inch (10 mm)** maximum.
- B. Variation in Surface Plane: Do not exceed **1/8 inch in 10 feet (3 mm in 3 m)**, **1/4 inch in 20 feet (6 mm in 6 m)**, or **3/8 inch (10 mm)** maximum from level or slope indicated.
- C. Variation in Plane between Adjacent Units (Lipping): Do not exceed **1/32-inch (0.8-mm)** difference between planes of adjacent units.

3.5 INSTALLATION OF STONE DIRECTLY OVER CONCRETE

- A. Saturate concrete 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 to damp concrete and broom to provide an even coating that completely covers the concrete. Do not exceed **1/16-inch (1.5-mm)** thickness. Limit area of mortar-bed bond coat to avoid its drying out before placing setting bed.
 - 1. Place reinforcing wire mesh over concrete, lapped at joints by at least one full mesh and supported so mesh becomes embedded in middle of setting bed. Hold edges back from vertical surfaces about 1/2 inch (13 mm).
- C. Apply mortar bed immediately after applying mortar-bed bond coat. Spread, tamp, and screed to uniform thickness at elevations required for setting stone to finished elevations indicated.
- D. Mix and place only that amount of mortar bed that can be covered with stone before initial set. Cut back, bevel edge, and discard material that has reached initial set before stone can be placed.
- E. Place stone before initial set of mortar occurs. Immediately before placing stone on setting bed, apply uniform **1/16-inch- (1.5-mm-)** thick bond coat to bed or to back of each stone unit.
- F. Tamp and beat stone with a wooden block or rubber mallet to obtain full contact with setting bed and to bring finished surfaces within indicated tolerances. Set each unit in a single operation before initial set of mortar; do not return to areas already set and disturb stone for purposes of realigning finished surfaces or adjusting joints.

3.6 STONE STAIR TREAD AND RISER INSTALLATION

- A. Install stone stair treads and risers to comply with "Installation of Stone Directly over Concrete" Article.

STONE FLOORING

- B. Install stone stair treads and risers in thin-set, latex-portland cement mortar to comply with ANSI A108.5.

3.7 ADJUSTING AND CLEANING

- A. Remove and replace stonework 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 paving, flooring, and joints not matching approved Samples and mockups.
 - 4. Stonework not complying with other requirements indicated.
- B. Replace in a manner that results in stonework matching approved Samples and mockups, complying with other requirements, and showing no evidence of replacement.
- C. In-Progress Cleaning: Clean stonework as work progresses. Remove mortar fins and smears before tooling joints.
- D. Clean stonework after setting and grouting are complete. Use procedures recommended by stone fabricator for types of application.
- E. Apply sealer to cleaned stonework according to sealer manufacturer's written instructions.

3.8 PROTECTION

- A. Prohibit traffic from installed stone for a minimum of 72 hours.
- B. Protect installed stonework during construction with nonstaining kraft paper. Where adjoining areas require construction work access, cover stonework with a minimum of **3/4-inch (20-mm)** untreated plywood over nonstaining kraft paper.

- END OF SECTION -

- SECTION 09 6400 -**BAMBOO 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. Factory-finished bamboo strip flooring.
- B. Related Sections:

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. LEED Submittals:
 - 1. Product Data for Credit EQ 4.1: For wood flooring installation adhesives, documentation including printed statement of VOC content.
 - 2. Product Data for Credit EQ 4.4: For composite wood products, documentation indicating that the bonding agent contains no urea formaldehyde.
 - 3. Product Data for Credit EQ 4: For adhesives, field-applied finishes, flooring system elements, and composite wood products including laboratory test reports indicating compliance with California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Shop Drawings: For each type of floor assembly and accessory. Include plans, elevations, sections, details, and attachments to other work. Include expansion provisions and trim details.
- D. Samples for Verification: For each type of wood flooring and accessory, with stain color and finish required, approximately **12 inches (300 mm)** long and of same thickness and material indicated for the Work and showing the full range of normal color and texture variations expected.

1.4 QUALITY ASSURANCE

- A. Bamboo Flooring: Comply with NWFA – National Wood Flooring Association "Technical Reference Manual".

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver wood flooring materials in unopened cartons or bundles.
- B. Protect wood flooring from exposure to moisture. Do not deliver wood flooring until after concrete, masonry, plaster, ceramic tile, and similar wet work is complete and dry.
- C. Store wood flooring materials in a dry, warm, ventilated, weathertight location.

1.6 PROJECT CONDITIONS

- A. Conditioning period begins not less than seven days before wood flooring installation, is continuous through installation, and continues not less than seven days after wood flooring installation.
 - 1. Environmental Conditioning: Maintain an ambient temperature between 65 and 75 deg F (18 and 24 deg C) and relative humidity planned for building occupants in spaces to receive wood flooring during the conditioning period.
 - 2. Wood Flooring Conditioning: Move wood flooring into spaces where it will be installed, no later than the beginning of the conditioning period.
 - a. Do not install flooring until it adjusts to relative humidity of, and is at same temperature as, space where it is to be installed.
 - b. Open sealed packages to allow wood flooring to acclimatize immediately on moving flooring into spaces in which it will be installed.
- B. After conditioning period, maintain relative humidity and ambient temperature planned for building occupants.
- C. Install factory-finished wood flooring after other finishing operations, including painting, have been completed.

1.7 EXTRA MATERIALS

- A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Wood Flooring: Equal to 10 percent of amount installed for each type of wood flooring indicated.

PART 2 - PRODUCTS

2.1 BAMBOO STRIP FLOORING

A. Manufacturer:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Plyboo Neopolitan Strand Bamboo Flooring manufactured by Smith & Fong Plyboo, San Francisco, CA, tel: (866) 835-9859, website: www.plyboo.com.

2.2 MATERIALS

A. Species: Moso (*Phyllostachys Pubescens*)

B. Edge Configuration: Tongue and groove, 4 sides.

C. Type: Strand.

1. Prefinished: 3-3/4 inches wide by 3/8 inch thick by 36 inches length.

D. Physical Mechanical Properties:

1. ASTM E 648: Critical Radiant Flux, Class I.
2. ASTM D 1037:
 - a. Dimensional Stability at 20 percent RH:
 - 1) Linear Expansion, Parallel -0.02, Perpendicular-0.23.
 - 2) Thickness Swell -0.25.
 - b. Hardness (Janka Ball Test) average 2899 lbf.
3. ASTM D 4442: Moisture Content: average 5 percent to 7 percent.
4. ASTM D 3501: Compressive Strength 9,431 pounds, maximum load 13,066 lbf.
5. No added urea formaldehyde.

E. Installation Adhesive:

1. Bostik's Best or as recommended by flooring manufacturer.

2.3 ACCESSORY MATERIALS

A. Wood Flooring Adhesive: Mastic recommended by flooring and adhesive manufacturers for application indicated.

1. Use adhesives that have a VOC content of not more than 100 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Trowelable Leveling and Patching Compound: Latex-modified, hydraulic-cement-based formulation approved by wood flooring manufacturer.

C. Base Shoe: Prefinished; 3/4 inch wide by 1/2 inch thick by 72 inches length to match flooring.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas and conditions, with Installer present, for compliance with requirements for maximum moisture content, installation tolerances, and other conditions affecting performance of wood flooring.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Concrete Slabs: Verify that concrete substrates are dry and moisture-vapor emissions are within acceptable levels according to manufacturer's written instructions.
 - 1. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft. (18.6 sq. m), and perform no fewer than two tests in each installation area and with test areas evenly spaced in installation areas.
 - a. Perform anhydrous calcium chloride test per ASTM F 1869, as follows:
 - 1) Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
 - b. Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.

3.2 PREPARATION

- A. Concrete Slabs: Grind high spots and fill low spots to produce a maximum **3/16inch (5-mm)** deviation in any direction when checked with a **10-foot (3-m)** straight edge.
 - 1. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, and depressions in substrates.
- B. Remove coatings, including curing compounds, and other substances on substrates that are incompatible with installation adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
- C. Broom or vacuum clean substrates to be covered immediately before product installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION

- A. Comply with flooring manufacturer's written installation instructions, but not less than applicable recommendations in NWFA's "Installation Guidelines: Wood Flooring".
- B. Provide expansion space at walls and other obstructions and terminations of flooring of not less than **1/2 inch (12.7 mm)**.
- C. Bamboo Strip Flooring: Set in adhesive.

3.4 CLEANING

- A. Repair or replace damaged installed products.
- B. Clean installed products in accordance with manufacturer's instructions.

3.5 PROTECTION

- A. Protect installed wood flooring during remainder of construction period with covering of heavy kraft paper or other suitable material. Do not use plastic sheet or film that might cause condensation.
- B. Do not move heavy and sharp objects directly over kraft-paper-covered wood flooring. Protect flooring with plywood or hardboard panels to prevent damage from storing or moving objects over flooring.

- END OF SECTION -

- SECTION 09 6466 -**WOOD ATHLETIC 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. This Section includes wood sports-floor assemblies.

1.3 RELATED SECTIONS

- A. Section 01 74 19 "Materials Recycling & Waste Management".
- B. Section 01 81 13 "LEED Certification Requirements".

1.4 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for wood sports-floor assemblies.
- B. Shop Drawings: Show installation details including location and layout of each type of floor assembly and accessory. Include the following:
 - 1. Expansion provisions and trim details.
 - 2. Locations of floor inserts for athletic equipment installed through flooring assembly.
- C. Samples for Initial Selection: Manufacturer's color charts showing colors and glosses available for the following:
 - 1. Floor finish.
- D. Samples for Verification: For each type of sports-floor assembly and accessory required; approximately **12 inches (300 mm)** long and of same thickness and material indicated for the Work.
 - 1. Include sample sets showing the full range of normal color and texture variations expected in wood flooring.
 - 2. Include sample sets showing finishes applied to wood flooring.
- E. LEED Submittals: See Section 018113 LEED Certification Requirements for the following:

1. Product Data for Credit EQ 4.1: For wood sports-floor assembly installation adhesives, including printed statement of VOC content.
 2. Product Data for Credit EQ 4.2: For field-applied finishes, including printed statement of VOC content.
 3. Certificates for Credit MR 7: Chain-of-custody certificates certifying that wood flooring complies with forest certification requirements. Include evidence that manufacturer is certified for chain of custody by an FSC-accredited certification body.
 - a. Include statement indicating costs for each certified wood product.
 4. MRc4 Recycled Content: Product data for products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content.
 - a. Include cost information for each product having recycled content.
 5. MRc5 Regional Materials:
 - a. Sourcing location(s): indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery from the project site.
 - b. Manufacturing location(s): indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
 - c. Product Value: indicate dollar value of product containing regional materials; include materials costs only.
 - d. Product Component(s) Value: Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.
- F. Qualification Data: For Installer.
- G. Maintenance Data: For wood sports-floor assemblies and finish systems to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.
- B. Installer Qualifications: An experienced installer who has completed wood sports-floor assembly installations similar in material, design, and extent to that indicated for this Project and whose work has resulted in installations with a record of successful in-service performance.
 1. Installer responsibilities include installation and field finishing of sports-floor assembly components and accessories, and application of game lines and markers.
- C. Forest Certification: Provide wood components produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."
- D. Maple Flooring: Comply with MFMA grading rules for species, grade, and cut.
 1. Certification: Provide flooring that carries MFMA mark on each bundle or piece.
- E. Mockups: Install mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

WOOD ATHLETIC FLOORING

1. To set quality standards for installation, install mockup of floor area as shown on Drawings.
2. To set quality standards for sanding and application of field finishes and game lines and markers, prepare finish mockup of floor area as shown on Drawings.
3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver assembly materials in unopened cartons or bundles.
- B. Protect wood from exposure to moisture. Do not deliver wood components until after concrete, masonry, plaster, ceramic tile, and similar wet work is complete and dry.
- C. Store wood components in a dry, warm, well-ventilated, weathertight location and in a horizontal position.

1.7 PROJECT CONDITIONS

- A. Conditioning period begins not less than seven days before sports-floor assembly installation, is continuous through installation, and continues not less than seven days after sports-floor installation.
 1. Environmental Conditioning: Maintain an ambient temperature between 65 and 75 deg F (18 and 24 deg C) and relative humidity planned for building occupants, but not less than 35 percent or more than 50 percent, in spaces to receive sports-floor assemblies during the conditioning period.
 2. Wood Conditioning: Move wood components into spaces where they will be installed, no later than beginning of the conditioning period.
 - a. Do not install sports-floor assemblies until wood components adjust to relative humidity of, and are at same temperature as, spaces where they are to be installed.
 - b. Open sealed packages to allow wood components to acclimatize immediately on moving wood components into spaces in which they will be installed.
- B. After conditioning period, maintain relative humidity and ambient temperature planned for building occupants.
- C. Install sports-floor assemblies after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: AcerFlex BP manufactured by Acer Flooring, LLC. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
 1. Action Floor Systems LLC.

2. Connor Sports Flooring, Inc.
3. Horner Flooring Company, Inc.
4. Mondo America, Inc.
5. Robbins, Inc.
6. Superior Floor Company, Inc.

2.2 DESCRIPTION

- A. System Type: Floating.
- B. Overall System Height: 2-1/2 inches (64 mm).

2.3 WOOD FLOORING

- A. Strip Flooring: Northern hard maple (*Acer saccharum*), kiln dried, random length, tongue and groove, and end matched.
 1. Grade: MFMA-RL Second and Better.
 2. Cut: Flat.
 3. Thickness: 25/32 inch (20 mm).
 4. Face Width: 2-1/4 inches (57 mm)
 5. Backs: Channeled (kerfed) for stress relief.
 6. Preservative Treatment: Clear, penetrating, water-repellent wood preservative that protects against mold, mildew, staining, and decay fungi; complying with MFMA's written recommendations and applied by immersion.

2.4 SUBFLOOR SYSTEM

- A. Plywood Underlayment: APA rated, C-D Plugged, exterior glue, tongue and groove, 15/32 inch (12 mm) thick.
- B. Resilient Pads: With air voids for resiliency and installed at manufacturer's standard spacing for product designation indicated above.
 1. Type: O-Ring design; 4-point contact pad.
 2. Material: Elastomeric TPR Rubber.
 3. Thickness 3/4 inch (19 mm).
 4. Product: Bi-Power Pad manufactured by Acer.

2.5 ACCESSORIES

- A. Vapor Retarder: ASTM D 4397, polyethylene sheet not less than 6 mils (0.15 mm) thick.
- B. Resilient Wall Base: Molded, vented, rubber or vinyl cove base; 3 by 4 (76 by 102 mm); with premolded outside corners.
 1. Color: TBD.
- C. Thresholds: As specified in Division 08 Section "Door Hardware."

WOOD ATHLETIC FLOORING

- D. Fasteners: Type and size recommended by manufacturer, but not less than those recommended by MFMA for application indicated.
- E. Trowelable Leveling and Patching Compound: Latex-modified, hydraulic-cement-based formulation approved by sports-floor manufacturer.
- F. Floor-Finish System: System of compatible components recommended in writing by flooring manufacturer and MFMA approved.
 - 1. Type: MFMA: Group 5, Water Based Finishes; polyurethane.
 - 2. Floor-Sealer Formulation: Pliable, penetrating type.
 - 3. Finish-Coat Formulation: Formulated for gloss finish and multicoat application.
 - 4. VOC content: Provide products that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - a. Floor Sealers and Finish Coats: VOC content of not more than 350 g/L.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas and conditions, with Installer present, for compliance with requirements for maximum moisture content, installation tolerances, and other conditions affecting performance of sports-floor assemblies.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. Concrete Slabs: Verify that concrete slabs comply with requirements specified in Division 3 Section "Cast-in-Place Concrete."
 - 1. Moisture Testing:
 - a. Perform anhydrous calcium chloride test per ASTM F 1869, as follows:
 - 1) Perform tests so that each test area does not exceed 200 sq. ft. (18.6 sq. m) and perform not less than 2 tests in each installation area and with test areas evenly spaced in installation areas.
 - 2) Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 4.5 lb of water/1000 sq. ft. (2.04 kg of water/92.9 sq. m) in 24 hours.
 - b. Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.

3.2 PREPARATION

- A. Grind high spots and fill low spots on concrete substrates to produce a maximum **1/8-inch (3-mm)** deviation in any direction when checked with a **10-foot (3-m)** straight edge.
 - 1. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, and depressions in substrates.
- B. Remove coatings including curing compounds and other substances on substrates that are incompatible with installation adhesives and that contain soap, wax, oil, or silicone; use mechanical methods recommended by manufacturer. Do not use solvents.

- C. Broom and vacuum clean substrates to be covered immediately before product installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION

- A. General: Comply with sports-floor assembly manufacturer's written instructions, but not less than written recommendations of MFMA applicable to flooring type indicated.
- B. Pattern: As indicated on Drawings.
- C. Expansion Spaces: Provide as indicated, but not less than that required by manufacturer's written instructions and MFMA's written recommendations at walls and other obstructions, and at interruptions and terminations of flooring.
 - 1. Cover expansion spaces with base molding and trim as indicated on Drawings.
- D. Vapor Retarder: Install with joints lapped a minimum of **6 inches (150 mm)** and sealed.
- E. Underlayment: Install perpendicular to direction of flooring, staggering end joints in adjacent rows.
- F. Install perimeter rows of cushions with no more than 6 inches (152 mm) from edge of sheet to center of cushion.
- G. Use a minimum of 12 inches (305 mm) staples to fasten the second layer of sheathing to the first.
- H. Strip Flooring: Mechanically fasten perpendicular to supports.
- I. Installation Tolerances: **1/8 inch in 10 feet (3 mm in 3 m)** of variance from level.

3.4 SANDING AND FINISHING

- A. Follow applicable recommendations in MFMA's "Industry Recommendations for Sanding, Sealing, Court Lining, Finishing, and Resurfacing of Maple Gym Floors."
- B. Allow installed flooring to acclimate to ambient conditions for at least 10 days before sanding.
- C. Machine sand with coarse, medium, and fine grades of sandpaper to achieve a level, smooth, uniform surface without ridges or cups. Remove sanding dust by tack or vacuum.
- D. Finish: Apply seal and finish coats of finish system according to finish manufacturer's written instructions. Provide not less than four coats total and not less than two finish coats.
 - 1. Water-Based Finishes: Use finishing methods recommended by finish manufacturer to reduce grain raise and sidebonding effect.

3.5 PROTECTION

- A. Protect sports floors during remainder of construction period to allow finish to cure and to ensure that flooring and finish are without damage or deterioration at time of Substantial Completion.

WOOD ATHLETIC FLOORING

1. Do not cover sports floors after finishing until finish reaches full cure, and not before seven days after applying last finish coat.
- B. Do not move heavy and sharp objects directly over sports floors. Protect fully cured floor finishes and surfaces with plywood or hardboard panels to prevent damage from storing or moving objects over sports floors.

- END OF SECTION -

- SECTION 09 6500 -

RESILIENT FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Linoleum sheet flooring.
- B. Related Sections:
 - 1. Section 01 74 19 "Materials Recycling & Waste Management".
 - 2. Section 01 81 13 "LEED Certification Requirements".
 - 3. Section 03 3000 "Cast-In-Place Concrete" for floor repair materials not covered under this section.
 - 4. Section 09 6513 "Resilient Wall Base and Accessories" for resilient base, reducer strips, and other accessories installed with linoleum floor covering.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. LEED Submittals: See Section 018113 LEED Certification Requirements for the following:
 - 1. Product Data for Credit MR 6.0: For linoleum flooring, including printed statement of costs for each rapidly renewable material.
 - 2. Product Data for Credit EQ 4.1: For adhesives, including printed statement of VOC content.
- C. Shop Drawings: For each type of floor covering. Include floor covering layouts, locations of seams, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
 - 1. Show details of special patterns.
- D. Samples for Initial Selection: For each type of floor covering indicated.
 - 1. Include similar Samples of installation accessories involving color selection.

- E. Samples for Verification: In manufacturer's standard size, but not less than 6-by-9-inch (152-by-230-mm) sections of each color and pattern of floor covering required.
 - 1. Heat-Welding Bead: Include manufacturer's standard-size Samples, but not less than 9 inches (230 mm) long, of each color required.
- F. Heat-Welded Seam Samples: For each floor covering product and welding bead color and pattern combination required; with seam running lengthwise and in center of 6-by-9-inch (152-by-230-mm) Sample applied to rigid backing and prepared by Installer for this Project.
- G. Product Schedule: For floor covering. Use same designations indicated on Drawings.
- H. Qualification Data: For qualified Installer.
- I. Maintenance Data: For each type of floor covering to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for floor covering installation.
 - 1. Engage an installer who employs workers for this Project who are trained or certified by manufacturer for installation techniques required.
- B. Fire-Test-Response Characteristics: 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.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store floor coverings and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 65 deg F (18 deg C) or more than 90 deg F (32 deg C).
 - 1. Sheet Flooring: Store rolls upright.

1.6 PROJECT CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C), in spaces to receive floor coverings during the following time periods:
 - 1. 72 hours before installation.
 - 2. During installation.
 - 3. 72 hours after installation.
- B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).
- C. Close spaces to traffic during floor covering installation.
- D. Close spaces to traffic for 72 hours after floor covering installation.

- E. Install floor coverings after other finishing operations, including painting, have been completed.

1.7 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Sheet Flooring: Furnish not less than 10 linear feet (3 linear m) for every 500 linear feet (150 linear m) or fraction thereof, in roll form and in full roll width for each color, pattern, and type of sheet flooring installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide one of the following:
 - 1. Johnsonite, Inc.
 - 2. Product: No substitutions allowed.
- B. Products: Subject to compliance with requirements, provide the following:
 - 1. The Tarkett Collection, Harmonium xf Sheet.
 - a. Style: Veneto.

2.2 LINOLEUM FLOOR COVERING

- A. Sheet Flooring: ASTM F 2034, Type I, linoleum sheet with backing.
 - 1. Roll Size: In manufacturer's standard length by not less than 78 inches (1980 mm) wide.
- B. Seaming Method: Heat welded.
- C. Thickness: 0.10 inch (2.5 mm).
- D. Colors:
 - 1. 608 Northern Lights.
 - 2. 624 Azurite.
 - 3. 610 Bituminous.
- E. Finish: Topshield Finish.

2.3 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by manufacturer to suit products and substrate conditions indicated.

1. Use adhesives that have a VOC content of zero (0) g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. Heat-Welding Bead: Solid-strand product of linoleum floor covering manufacturer.
 1. As selected by Architect from manufacturer's full range.
- D. Floor Polish: Provide protective liquid floor polish products as recommended by manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor coverings.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of floor coverings.
- 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 floor covering adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
 3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
 4. Moisture Testing: Perform tests recommended by manufacturer and as follows. Proceed with installation only after substrates pass testing.
 - a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 5 lbs of water/1000 sq. ft. (2.4 kg of water/92.9 sq. m) in 24 hours.
 - b. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have maximum 75 percent relative humidity level measurement.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install floor coverings until they are same temperature as space where they are to be installed.

1. Move floor coverings and installation materials into spaces where they will be installed at least 72 hours in advance of installation.

- E. Sweep and vacuum clean substrates to be covered by floor coverings immediately before installation.

3.3 INSTALLATION, GENERAL

- A. Comply with manufacturer's written instructions for installing floor coverings.
- B. Scribe and cut floor coverings to butt neatly and tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings.
- C. Extend floor coverings into toe spaces, door reveals, closets, and similar openings.
- D. Maintain reference markers, holes, or openings that are in place or marked for future cutting by repeating on floor coverings as marked on subfloor. Use chalk or other nonpermanent marking device.
- E. Install floor coverings on covers for telephone and electrical ducts and similar items in finished floor areas. Maintain overall continuity of color and pattern between pieces of floor covering installed on covers and adjoining floor covering. Tightly adhere floor covering edges to substrates that abut covers and to cover perimeters.
- F. Adhere floor coverings to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.
- G. Heat-Welded Seams: Comply with ASTM F 1516. Rout joints and use welding bead to permanently fuse sections into a seamless floor covering. Prepare, weld, and finish seams to produce surfaces flush with adjoining floor covering surfaces.

3.4 LINOLEUM SHEET FLOORING INSTALLATION

- A. Unroll sheet floorings and allow them to stabilize before cutting and fitting.
- B. Lay out sheet floorings as follows:
 1. Maintain uniformity of floor covering direction.
 2. Minimize number of seams; place seams in inconspicuous and low-traffic areas, at least 6 inches (152 mm) away from parallel joints in floor covering substrates.
 3. Match edges of floor coverings for color shading at seams.
 4. Avoid cross seams.
 5. Eliminate deformations that result from hanging method used during drying process (stove bar marks).

3.5 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protection of floor coverings.
- B. Perform the following operations immediately after completing floor covering installation:

1. Remove adhesive and other blemishes from exposed surfaces.
 2. Sweep and vacuum surfaces thoroughly.
 3. Damp-mop surfaces to remove marks and soil.
- C. Protect floor coverings from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Floor Polish: Remove soil, visible adhesive and surface blemishes from floor coverings before applying liquid floor polish.
1. Apply number of coats as recommended by manufacturer.
- E. After allowing drying room film (yellow film caused by linseed oil oxidation) to disappear, cover floor coverings until Substantial Completion.

- END OF SECTION -

- SECTION 09 6513 -**RESILIENT WALL BASE & 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. This Section contains Specifications for the following:
 - 1. Rubber wall base, straight & cove toe.
 - 2. Flooring transition molding.

1.3 RELATED SECTIONS

- A. Section 01 74 19 "Materials Recycling & Waste Management".
- B. Section 01 81 13 "LEED Certification Requirements".
- C. Section 09 6500 "Resilient Flooring" for resilient sheet floor coverings.
- D. Section 09 6566 "Rubber Athletic Flooring" for resilient floor coverings for use in athletic-activity or support areas.

1.4 SUBMITTALS

- A. Product data for each type of product specified.
- B. LEED Submittals: See Section 018113 LEED Certification Requirements for the following:
 - 1. Product Data for Credit EQ 4.1: For adhesives, including printed statement of VOC content.
 - 2. MRc4 Recycled Content: Product data for products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content.
 - a. Include cost information for each product having recycled content.
 - 3. MRc5 Regional Materials:
 - a. Sourcing location(s): indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery from the project site.

- b. Manufacturing location(s): indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
 - c. Product Value: indicate dollar value of product containing regional materials; include materials costs only.
 - d. Product Component(s) Value: Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.
 - e. Include cost information for each certified wood product.
- C. Samples for Initial Selection: For each type of product indicated.
- D. Samples for Verification: For each type of product indicated, in manufacturer's standard-size Samples but not less than **12 inches (300 mm)** long, of each resilient product color, texture, and pattern required.
- E. Product Schedule: For resilient products. As indicated on Drawings.

1.5 QUALITY ASSURANCE

- A. Single-Source Responsibility for Products: Obtain each type and color of product specified from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.
- B. Fire Performance Characteristics: Provide products with the following fire performance characteristics as determined by testing products per ASTM test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
- 1. Critical Radiant Flux: 0.45 watts per sq. cm or more per ASTM E 648.
 - 2. Smoke Density: Less than 450 per ASTM E 662.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to Project site in original manufacturer's unopened cartons and containers, each bearing names of product and manufacturer, Project identification, and shipping and handling instructions.
- B. Store products in dry spaces protected from the weather with ambient temperatures maintained between 50 deg F and 90 deg F.
- C. Move products into spaces where they will be installed at least 48 hours in advance of installation.

1.7 PROJECT CONDITIONS

- A. Maintain a minimum temperature of 70 deg F in spaces to receive products specified in this Section for at least 48 hours prior to installation, during installation, and for not less than 48 hours after installation. After this period, maintain a temperature of not less than 55 deg F.
- B. Do not install products until they are at the same temperature as that of the space where they are to be installed.

- C. Close spaces to traffic during installation of products specified in this Section.

1.8 SEQUENCING AND SCHEDULING

- A. Sequence installing products specified in this Section with other construction to minimize possibility of damage and soiling during remainder of construction period.

1.9 EXTRA MATERIALS

- A. Deliver extra materials to Owner. Furnish extra materials matching products installed as described below, packaged with protective covering for storage, and identified with labels clearly describing contents.
 - 1. Furnish not less than 10 linear feet for each 500 linear feet or fraction thereof of each different type and color of resilient wall base installed.
 - 2. Deliver extra materials to Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturer: Provide the following:
 - 1. Burke Flooring, District Standard, No substitutions allowed.

2.2 RESILIENT WALL BASE

- A. Resilient Base Standard: ASTM F 1861.
 - 1. Material Requirement: Type TP (rubber, thermoplastic).
 - 2. Manufacturing Method: Group I (solid, homogeneous) or Group II (layered).
 - 3. Style: Cove (base with toe) and Straight (flat or toeless).
- B. Minimum Thickness: 0.125 inch (3.2 mm).
- C. Height: 4 inches (102 mm).
- D. Lengths: Coils in manufacturer's standard length but not less than 100 feet.
- E. Outside Corners: Job formed.
- F. Inside Corners: Job formed.
- G. Colors and Patterns: 523 Black/Brown.

2.3 RESILIENT MOLDING ACCESSORIES

- A. Description: Carpet edge for carpet tile applications and reducer strip for resilient floor covering.
 - 1. Johnsonite, Rubber DC.
 - 2. Burke Flooring Products; Type TS

3. Roppe Corporation; Series 50, Transition Strips and stair treads.
- B. Material: Rubber.
- C. Colors: Refer to drawings.

2.4 INSTALLATION ACCESSORIES

- A. Adhesives: Water-resistant type recommended by manufacturer to suit resilient flooring product and substrate conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas where installation of products specified in this Section will occur, with Installer present, to verify that substrates and conditions are satisfactory for installation and comply with manufacturer's requirements and those specified in this Section.
 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
 2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with manufacturer's installation specifications for preparing substrates indicated to receive products indicated.
- B. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
 1. Do not install resilient products until they are the same temperature as the space where they are to be installed.
- C. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
 1. Do not install resilient products until they are the same temperature as the space where they are to be installed.

3.3 RESILIENT WALL BASE INSTALLATION

- A. General: Install products specified in this Section using methods indicated according to manufacturer's installation directions.
- B. Apply resilient wall base to walls, columns, pilasters, casework, and other permanent fixtures in rooms and areas where base is required. Install wall base in lengths as long as practicable. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

RESILIENT WALL BASE & ACCESSORIES

1. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient wall base with manufacturer's recommended adhesive filler material.
- C. Place resilient accessories so they are butted to adjacent materials of type indicated and bond to substrates with adhesive. Install reducer strips at edges of flooring that otherwise would be exposed.
- D. Job-Formed Corners:
 1. Outside Corners: Use straight pieces of maximum lengths possible. Form without producing discoloration (whitening) at bends.
 2. Inside Corners: Use straight pieces of maximum lengths possible.
- E. Joints: Minimize joints. No joints in corners.

3.4 RESILIENT ACCESSORY INSTALLATION

- A. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor coverings that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

- A. Perform the following operations immediately after completing installation:
 1. Remove visible adhesive and other surface blemishes using cleaner recommended by manufacturers of resilient product involved.
 2. Sweep or vacuum floor thoroughly.
 3. Do not wash floor until after time period recommended by manufacturer.
 4. Damp-mop resilient accessories to remove black marks and soil.
- B. Protect flooring against mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods indicated or recommended by manufacturer of resilient product involved.
 1. Apply protective floor polish to resilient accessories that are free from soil, visible adhesive and surface blemishes.
 - a. Use commercially available metal, cross-linked, acrylic product acceptable to resilient accessory manufacturer.
 - b. Coordinate selection of floor polish with Owner's maintenance service.
 2. Cover resilient accessories on floors and stairs with undyed, untreated building paper until inspection for Substantial Completion.
- C. Do not move heavy and sharp objects directly over stair accessories. Place plywood or hardboard panels over surfaces and under objects while they are being moved. Slide or roll objects over panels without moving panels.
- D. Clean products specified in this Section not more than 4 days prior to dates scheduled for inspections intended to establish date of Substantial Completion in each area of Project. Clean products using method recommended by manufacturer.
 1. Strip protective floor polish that was applied after completing installation, prior to cleaning.

2. Reapply floor polish after cleaning.

- END OF SECTION -

- SECTION 09 6516 -

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 SUMMARY

- A. Section Includes:
 - 1. Vinyl sheet floor covering, with backing.

1.3 RELATED SECTIONS

- A. Section 03 3000 "Cast-In-Place Concrete" for floor repair materials not covered under this section.
- B. Section 03 3357 "Water Vapor Emission Control System.
- C. Section 09 6513 "Resilient Base and Accessories" for resilient base, reducer strips, and other accessories installed with resilient floor coverings.
- D. Section 09 6500 "Resilient Flooring" for linoleum sheet floor coverings.
- E. Section 09 6566 "Resilient Athletic Flooring" for resilient floor coverings for use in athletic-activity or support areas.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. LEED Submittals:
 - 1. Product Data for Credit EQ 4.1: For adhesives, including printed statement of VOC content.
- C. Shop Drawings: For each type of floor covering. Include floor covering layouts, locations of seams, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
 - 1. Show details of special patterns.

- D. Samples for Verification: In manufacturer's standard size, but not less than 6-by-9-inch (150-by-230-mm) sections of each different color and pattern of floor covering required.
 - 1. For heat-welding bead, manufacturer's standard-size Samples, but not less than 9 inches (230 mm) long, of each color required.
- E. 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 (150-by-230-mm) Sample applied to a rigid backing and prepared by Installer for this Project.
- F. Product Schedule: For floor coverings. Use same designations indicated on Drawings.
- G. Qualification Data: For qualified Installer.
- H. Maintenance Data: For each type of floor covering to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for floor covering installation and seaming method indicated.
 - 1. Engage an installer who employs workers for this Project who are trained or certified by floor covering manufacturer for installation techniques required.
- B. Fire-Test-Response Characteristics: 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.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store floor coverings 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 (10 deg C) or more than 90 deg F (32 deg C). Store rolls upright.

1.7 PROJECT CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 65 deg F (18 deg C) or more than 85 deg F (29 deg C), in spaces to receive floor coverings during the following time periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.
- B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).
- C. Close spaces to traffic during floor covering installation.
- D. Close spaces to traffic for 48 hours after floor covering installation.
- E. Install floor coverings after other finishing operations, including painting, have been completed.

RESILIENT SHEET FLOORING

1.8 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Floor Covering: Furnish quantity not less than 10 linear feet (3 linear m) for every 500 linear feet (150 linear m) or fraction thereof, in roll form and in full roll width for each color, pattern, and type of floor covering installed.

1.9 WARRANTY

- A. Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of resilient sheet flooring installation that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 7 years from date of Substantial Completion.

PART 2 - PRODUCTS**2.1 VINYL SHEET FLOOR COVERING**

- A. Products: Subject to compliance with requirements, provide the following:
 - 1. Altro Group; Product: Altro Suprema.
- B. Vinyl Sheet Floor Covering with Backing: ASTM F 1303.
 - 1. Type (Binder Content): Type II, minimum binder content of 34 percent.
 - 2. Wear-Layer Thickness: Grade 1.
 - 3. Overall Thickness: 0.08 inch (2.0 mm).
 - 4. Backing Class: Class A (fibrous).
 - 5. Coefficient of Static Friction: >.6.
- C. Sheet Width: 6.7 feet (2.0 m).
- D. Seaming Method: Heat welded.
- E. Colors and Patterns: As selected by Architect from full range of industry colors.

2.2 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by manufacturer to suit floor covering and substrate conditions indicated.
 - 1. Use adhesives that have a VOC content of not more than 50 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. Seamless-Installation Accessories:

1. Heat-Welding Bead: Manufacturer's solid-strand product for heat welding seams.
 - a. Color: As selected by Architect from manufacturer's full range to contrast with floor covering.
- D. Integral-Flash-Cove-Base Accessories:
 1. Cove Strip: 1-inch (25-mm) radius provided or approved by manufacturer.
 2. Cap Strip: Square metal, vinyl, or rubber cap provided or approved by manufacturer.
 3. Corners: Metal inside and outside corners and end stops provided or approved by manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor coverings.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of floor coverings.
- B. Concrete Substrates: Prepare according to ASTM F 710.
 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
 3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
 4. Moisture Testing: Perform tests recommended by manufacturer and as follows. Proceed with installation only after substrates pass testing.
 - a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
 - b. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

- D. Do not install floor coverings until they are same temperature as space where they are to be installed.
 - 1. Move floor coverings and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
- E. Sweep and vacuum clean substrates to be covered by floor coverings immediately before installation.

3.3 FLOOR COVERING INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor coverings.
- B. Unroll floor coverings and allow them to stabilize before cutting and fitting.
- C. Lay out floor coverings as follows:
 - 1. Maintain uniformity of floor covering direction.
 - 2. Minimize number of seams; place seams in inconspicuous and low-traffic areas, at least 6 inches (152 mm) away from parallel joints in floor covering substrates.
 - 3. Match edges of floor coverings for color shading at seams.
 - 4. Avoid cross seams.
- D. Scribe and cut floor coverings to butt neatly and tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, and door frames.
- E. Extend floor coverings into toe spaces, door reveals, closets, and similar openings.
- F. Maintain reference markers, holes, or openings that are in place or marked for future cutting by repeating on floor coverings as marked on substrates. Use chalk or other nonpermanent marking device.
- G. Install floor coverings on covers for telephone and electrical ducts and similar items in installation areas. Maintain overall continuity of color and pattern between pieces of floor coverings installed on covers and adjoining floor covering. Tightly adhere floor covering edges to substrates that abut covers and to cover perimeters.
- H. Adhere floor coverings to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.
- I. Seamless Installation:
 - 1. Heat-Welded Seams: Comply with ASTM F 1516. Rout joints and use welding bead to permanently fuse sections into a seamless floor covering. Prepare, weld, and finish seams to produce surfaces flush with adjoining floor covering surfaces.
- J. Integral-Flash-Cove Base: Cove floor coverings dimension indicated up vertical surfaces. Support floor coverings at horizontal and vertical junction by cove strip. Butt at top against cap strip.
 - 1. Install metal corners at inside and outside corners.

3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protection of floor coverings.
- B. Perform the following operations immediately after completing floor covering installation:
 - 1. Remove adhesive and other blemishes from floor covering surfaces.
 - 2. Sweep and vacuum floor coverings thoroughly.
 - 3. Damp-mop floor coverings to remove marks and soil.
- C. Protect floor coverings from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Cover floor coverings until Substantial Completion.

- END OF SECTION -

- SECTION 09 6566 -

RESILIENT ATHLETIC 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. This Section includes the following:
 - 1. Rubber Sheet Flooring.

1.3 RELATED SECTIONS

- A. Section 01 74 19 "Materials Recycling & Waste Management".
- B. Section 01 81 13 "LEED Certification Requirements".
- C. Division 9 Section "Resilient Wall Base and Accessories" for wall base and accessories installed with floor coverings.
- D. Division 9 Sections for resilient floor coverings installed in areas other than athletic-activity spaces.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show installation details and locations of the following:
 - 1. Border tiles.
 - 2. Floor patterns.
 - 3. Locations of floor inserts for athletic equipment.
- C. Samples for Initial Selection: For each type of floor covering indicated.
- D. Samples for Verification: For each type, color, and pattern of floor covering indicated, **6-inch-(150-mm-)** square Samples of same thickness and material indicated for the Work.

- E. LEED Submittals: See Section 018113 LEED Certification Requirements for the following:
 - 1. Credit EQ 4.1: Manufacturers' product data for adhesives, including printed statement of VOC content.
 - 2. Credit EQ 4.2: Manufacturers' product data for game-line and marker paints, including printed statement of VOC content.
 - 3. Product Data for Credit MR 4.1: For products having recycled content, documentation indicating percentages by weight of post-consumer and pre-consumer recycled content.
 - a. Include statement that indicates costs for each product having recycled content.
 - 4. MRc5 Regional Materials:
 - a. Sourcing location(s): indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery from the project site.
 - b. Manufacturing location(s): indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
 - c. Product Value: indicate dollar value of product containing regional materials; include materials costs only.
 - d. Product Component(s) Value: Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.
- F. Quality Assurance Submittals:
 - 1. Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.
 - 2. Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
 - 3. Manufacturer's Instructions: Manufacturer's installation instructions.
- G. Operation and Maintenance Data: For floor coverings to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Installer Qualifications: Installer experienced in performing work of this section who has specialized in installation of work similar to that required for this project.
 - a. Certificate: When requested, submit certificate indicating qualification.
 - 2. Manufacturer's Qualifications: Manufacturer capable of providing field service representation during construction and approving application method.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storing.
- B. Store materials to prevent deterioration. Store tiles on flat surfaces.

1.7 PROJECT CONDITIONS

- A. Temperature Requirements: Maintain air temperature in spaces where products will be installed for time period before, during and after installation as recommended by manufacturer.
- B. Field Measurements: Verify actual measurements/openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays..

1.8 EXTRA MATERIALS

- A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Sheet Flooring: Furnish full-width rolls of not less than 10 linear feet (3 linear m) for each 500 linear feet (150 linear m) or fraction thereof, of each type, color, and pattern of flooring installed.

PART 2 - PRODUCTS**2.1 RUBBER SHEET FLOORING**

- A. Manufacturer: Ram Flex manufactured by Mondo USA, Lynnwood, WA, tel: (800) 962-5334, website: mondousa.com.
- B. Material: Prefabricated rubber athletic flooring, calendered and vulcanized with a base of natural and synthetic rubbers, stabilizing agents and pigmentation. Manufactured in two layers which are vulcanized together. The shore hardness of the top layer will be greater than that of the bottom layer; shore hardness of layers to be recommended by the Manufacturer and the limits specified.
- C. Thicknesses: 0.394" (10mm).
- D. Colors:
 - 1. G710 Blue.
 - 2. G786 Marine Blue.
- E. Finish: hammered.
- F. Roll Size: 6 feet wide by longest length that is practical to minimize splicing during installation.
- G. Performance characteristics:
 - 1. Performance of the prefabricated rubber athletic flooring to conform to the following criteria:

Performance Criteria	Test Method	Result
Hardness Shore A	ASTM D 2240	77/71

Critical Radiant Flux	ASTM E 648, NFPA 101	0.58 W/cm ² , Type I
Optical Density of Smoke	ASTM E 662	< 450, Class I
Fungal Resistance Test	ASTM G 21-90	No growth
Coefficient of Friction	ASTM D 2047	1.0 dry, 1.2 wet
V.O.C. Compliant	ASTM D 5116	Yes
Color Stability		Good
Light reflection		Average
Chemical Resistance		Good

2.2 INSTALLATION ACCESSORIES

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland-cement-based formulation provided or approved by tile manufacturer for applications indicated.
- B. Adhesive: E-Grip II one-component polyurethane adhesive manufactured by ECORE’s ECO Surfaces. One-component polyurethane moisture cured, non-sag, permanently elastic adhesive that has excellent adhesion to concrete and is engineered for indoor and outdoor applications.
 - 1. Color: Medium Grey.
 - 2. VOC Content: 0.29 lb/gal (34 g/L)
 - 3. Application Temperature: 40 degrees F to 100 degrees F.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances, moisture content, and other conditions affecting performance.
 - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
 - 2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written recommendations to ensure adhesion of floor coverings.
- B. Concrete Substrates: Prepare according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Alkalinity and Adhesion Testing: Perform tests recommended in writing by manufacturer. Proceed with installation only after substrates pass testing.
 - 3. Moisture Testing:
 - a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 5.5 lb of water/1000 sq. ft. in 24 hours.
 - 1) Perform tests so that each test area does not exceed 200 sq. ft. (18.6 sq. m) and perform not less than 2 tests in each installation area and with test areas evenly spaced in installation areas.
 - b. Perform tests recommended in writing by manufacturer. Proceed with installation only after substrates pass testing.
- C. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended in writing by manufacturer. Do not use solvents.
- D. Use trowelable leveling and patching compound to fill cracks, holes, and depressions in substrates.
- E. Move floor coverings and installation materials into spaces where they will be installed at least 48 hours in advance of installation, unless manufacturer recommends a longer period in writing.
 - 1. Do not install floor coverings until they are same temperature as space where they are to be installed.
- F. Sweep and vacuum clean substrates to be covered by floor coverings immediately before installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, and dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 FLOORING INSTALLATION, GENERAL

- A. Comply with manufacturer's written installation instructions.
- B. Scribe, cut, and fit flooring to butt neatly and tightly to vertical surfaces, equipment anchors, floor outlets, and other interruptions of floor surface.
- C. Extend flooring into toe spaces, door reveals, closets, and similar openings unless otherwise indicated.
- D. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating subfloor markings on flooring. Use nonpermanent, nonstaining marking device.

3.4 SHEET FLOORING INSTALLATION

- A. Unroll sheet flooring and allow it to stabilize before cutting and fitting.
- B. Lay out 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 (150 mm) away from parallel joints in flooring substrates.
 - 3. Match edges of flooring for color shading at seams.
 - 4. Locate seams per approved Shop Drawings.
- C. Adhered Flooring: Adhere products to substrates using a full spread of adhesive applied to substrate to comply with adhesive and flooring manufacturers' written instructions, including those for trowel notching, adhesive mixing, and adhesive open and working times.
- D. Provide completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.5 CLEANING AND PROTECTING

- A. Cleaning: Remove temporary coverings and protection of adjacent work areas. Repair or replace damaged products. Clean installed products in accordance with manufacturer's instructions.
- B. Perform the following operations immediately after completing flooring installation:
 - 1. Remove adhesive and other blemishes from flooring surfaces.
 - 2. Sweep and vacuum flooring thoroughly.
 - 3. Damp-mop flooring to remove marks and soil after time period recommended in writing by manufacturer.
- C. Protect floor coverings from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods recommended in writing by manufacturer.
 - 1. Do not move heavy and sharp objects directly over floor coverings. Protect floor coverings with plywood or hardboard panels to prevent damage from storing or moving objects over floor coverings.

- END OF SECTION -

- SECTION 09 6816 -

SHEET CARPETING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Tufted carpet.

1.3 RELATED SECTIONS

- A. Section 01 74 19 "Materials Recycling & Waste Management".
- B. Section 01 81 13 "LEED Certification Requirements".
- C. Section 09 6513 – Resilient Wall Base and Accessories for resilient wall base and accessories installed with sheet carpet.

1.4 SUBMITTALS

- A. Product Data: For the following, including installation recommendations for each type of substrate:
 - 1. Carpet: For each type indicated. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
- B. Shop Drawings: Show the following:
 - 1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet.
 - 2. Carpet type, color, and dye lot.
 - 3. Seam locations, types, and methods.
 - 4. Type of subfloor.
 - 5. Type of installation.
 - 6. Pattern type, repeat size, location, direction, and starting point.
 - 7. Pile direction.
 - 8. Type, color, and location of insets and borders.

9. Type, color, and location of edge, transition, and other accessory strips.
 10. Transition details to other flooring materials.
- C. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
1. Carpet: 12-inch- (300-mm-) square Sample.
 2. Exposed Edge, Transition, and other Accessory Stripping: 12-inch- (300-mm-) long Samples.
 3. Carpet Seam: 6-inch (150-mm) Sample.
 4. Mitered Carpet Border Seam: 12-inch- (300-mm-) square Sample. Show carpet pattern alignment.
- D. LEED Submittals: See Section 018113 LEED Certification Requirements for the following:
1. Product Data for Credit EQ 4.3:
 - a. For carpet, documentation indicating compliance with testing and product requirements of Carpet and Rug Institute's "Green Label Plus" program.
 - b. For carpet cushion, documentation indicating compliance with testing and product requirements of Carpet and Rug Institute's "Green Label" program.
 - c. For installation adhesive, including printed statement of VOC content.
 2. MRc4 Recycled Content: Product data for products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content.
 - a. Include cost information for each product having recycled content.
 3. EQc4.1 Adhesives & Sealants: Product data for adhesives & sealants, including printed statement of VOC content and chemical components.
- E. Product Schedule: For carpet. Use same designations indicated on Drawings.
- F. Qualification Data: For Installer.
- G. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency.
- H. Maintenance Data: For carpet to include in maintenance manuals. Include the following:
1. Methods for maintaining carpet, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
 2. Precautions for cleaning materials and methods that could be detrimental to carpet.
- I. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is certified by the Floor Covering Installation Board or who can demonstrate compliance with its certification program requirements.

- B. Fire-Test-Response Characteristics: Provide products with the critical radiant flux classification indicated in Part 2, as determined by testing identical products per ASTM E 648 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.
- C. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to carpet installation including, but not limited to, the following:
 - 1. Review delivery, storage, and handling procedures.
 - 2. Review ambient conditions and ventilation procedures.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Comply with CRI 104, Section 5, "Storage and Handling."

1.7 PROJECT CONDITIONS

- A. Comply with CRI 104, Section 7.2, "Site Conditions; Temperature and Humidity" and Section 7.12, "Ventilation."
- B. Environmental Limitations: Do not install carpet until wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- C. Do not install carpet over concrete slabs until slabs have cured, are sufficiently dry to bond with adhesive, and have pH range recommended by carpet manufacturer.
- D. Where demountable partitions or other items are indicated for installation on top of carpet, install carpet before installing these items.

1.8 WARRANTY

- A. Special Warranty for Carpet: Manufacturer's standard form in which manufacturer agrees to repair or replace components of carpet installation that fail in materials or workmanship within specified warranty period.
 - 1. Warranty does not include deterioration or failure of carpet due to unusual traffic, failure of substrate, vandalism, or abuse.
 - 2. Failures include, but are not limited to, more than 10 percent loss of face fiber, edge raveling, snags, runs, loss of tuft bind strength, and delamination.
 - 3. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 TUFTED CARPET

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Collins & Aikman, A Tandus Company, Dalton, GA, tel: (800) 248-2878. District Standard, No substitutions allowed.
- B. Sheet Carpet: Voyager Ganymede

1. Construction: Textured Patterned Loop
 2. Gauge: 1/13
 3. Stitched per Inch: 8.4
 4. Pile Height Average: 0.117 inch
 5. Fiber System: TDX Nylon
 6. Dye Method: 60% Solution Dyed/40% Yarn Dyed
 7. Primary Backing: Powerbond RS, Closed-Cell Vinyl Cushion.
 - a. Total Recycled Content: (Post-industrial and post-consumer) 30-50%.
 8. Size: 6 foot or 12 foot roll.
 9. Applied Soil-Resistance Treatment: Ensure
 10. Color: Ganymede 05158-20605
- C. Performance Characteristics: As follows:
1. Dimensional Tolerance: Within **1/32 inch** of specified size dimensions, as determined by physical measurement.
 2. Dimensional Stability: 0.1 percent or less per ISO 2551 (Aachen Test).
 3. Noise Reduction Coefficient (NRC): per ASTM C 423.
 4. Colorfastness to Light: Not less than 4 after 60 AFU (AATCC fading units) per AATCC 16, Option E.
 5. Electrostatic Propensity: Less than 3.0 kV per AATCC 134.

2.2 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet manufacturer.
- B. Adhesives: Water-resistant, mildew-resistant, nonstaining type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet and is recommended or provided by carpet manufacturer.
 1. VOC Limits: Provide adhesives with VOC content not more than 50g/L when calculated according to 40 CFR 59, Subpart D (EPA method 24).
- C. Tackless Carpet Stripping: Water-resistant plywood, in strips as required to match cushion thickness and that comply with CRI 104, Section 12.2.
- D. Seam Adhesive: Hot-melt adhesive tape or similar product recommended by carpet manufacturer for sealing and taping seams and butting cut edges at backing to form secure seams and to prevent pile loss at seams.
- E. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed edge of carpet, and of maximum lengths to minimize running joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet performance. Examine carpet for type, color, pattern, and potential defects.
- B. Concrete Substrates: Prepare according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Alkalinity and Adhesion Testing: Perform tests recommended in writing by manufacturer. Proceed with installation only after substrates pass testing.
 - 3. Moisture Testing:
 - a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
 - 1) Perform tests so that each test area does not exceed 200 sq. ft. (18.6 sq. m) and perform not less than 2 tests in each installation area and with test areas evenly spaced in installation areas.
 - 4. Perform tests recommended in writing by manufacturer. Proceed with installation only after substrates pass testing.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with CRI 104, Section 7.3, "Site Conditions; Floor Preparation," and with carpet manufacturer's written installation instructions for preparing substrates.
- B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch (3 mm) wide or wider, and protrusions more than 1/32 inch (0.8 mm), unless more stringent requirements are required by manufacturer's written instructions.
- C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by carpet manufacturer.
- D. Broom and vacuum clean substrates to be covered immediately before installing carpet.

3.3 INSTALLATION

- A. Comply with CRI 104 and carpet manufacturer's written installation instructions for the following:
 - 1. Preapplied Adhesive Installation: Comply with CRI 104, Section 11.4, "Pre-Applied Adhesive Systems (Peel and Stick)."

- B. Comply with carpet manufacturer's written recommendations and Shop Drawings for seam locations and direction of carpet; maintain uniformity of carpet direction and lay of pile. At doorways, center seams under the door in closed position.
- C. Do not bridge building expansion joints with carpet.
- D. Cut and fit carpet to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet manufacturer.
- E. Extend carpet into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.
- G. Install pattern parallel to walls and borders to comply with CRI 104, Section 15, "Patterned Carpet Installations" and with carpet manufacturer's written recommendations.

3.4 CLEANING AND PROTECTING

- A. Perform the following operations immediately after installing carpet:
 - 1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet manufacturer.
 - 2. Remove yarns that protrude from carpet surface.
 - 3. Vacuum carpet using commercial machine with face-beater element.
- B. Protect installed carpet to comply with CRI 104, Section 16, "Protection of Indoor Installations."
- C. Protect carpet against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet manufacturer and carpet adhesive manufacturer.

- END OF SECTION -

- SECTION 09 8100 -

ACOUSTICAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Glass fiber acoustic board.
 - 2. Fiberglass sound batts.

1.3 RELATED SECTIONS

- A. Section 01 74 19 "Materials Recycling & Waste Management".
- B. Section 01 81 13 "LEED Certification Requirements".
- C. Section 07 2100 "Thermal Insulation" for thermal insulation applications.

1.4 SUBMITTALS

- A. Product data for each type of insulation product specified.
- B. Product test reports from and based on tests performed by qualified independent testing laboratory evidencing compliance of fire performance characteristics, and other properties, based on comprehensive testing of current products.
- C. LEED Submittal: See Section 018113 LEED Certification Requirements for the following:
 - 1. Product Data for Credit MR 4.1 and MR 4.2: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
 - a. Include statement indicating costs for each product having recycled content.
 - 2. MRc5 Regional Materials:
 - a. Sourcing location(s): indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery from the project site.

- b. Manufacturing location(s): indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
 - c. Product Value: indicate dollar value of product containing regional materials; include materials costs only.
 - d. Product Component(s) Value: Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.
3. EQc4.1 Adhesives & Sealants: Product data for adhesives & sealants, including printed statement of VOC content and chemical components.

1.5 QUALITY ASSURANCE

- A. Fire Performance Characteristics: Provide insulation materials identical to those whose indicated fire performance characteristics have been determined per the ASTM test method indicated below, by UL or other testing and inspecting organizations acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing and inspecting organization.
1. Surface Burning Characteristic: ASTM E 84.
 2. Fire Resistance Ratings: ASTM E 119.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's recommendations for handling, storage, and protection during installation.

PART 2 - PRODUCTS

2.1 FIBERGLASS INSULATION

- A. Manufacturers: Subject to compliance with requirements, provide insulation products of one of the following:
1. Manufacturers of Glass Fiber Wall Insulation:
 - a. Johns Manville Insulations (Sound Shield Batts, 4" thick).
 - b. Owens/Corning Fiberglas Corp. (Sound Attenuation Batts, 3-1/2" thick).
 - c. CertainTeed Corp. (CertaSound Attenuation Batts, 3-1/2" thick).
- B. Materials
1. Sound Attenuation Batts: Fiberglass, unfaced, with a Fire Hazard Classification of 250-50 or less when tested in accordance with ASTM E-84-89a, Standard Test Method for Surface Burning Characteristics of Building Materials; ASTM C-665-88 Standard Specification for Mineral Fiber Blanket Thermal Insulation, Type 1, Class B, and Federal Specification HH-I-521F, Type I.

ACOUSTICAL INSULATION

2.2 AUXILIARY INSULATING MATERIALS

- A. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation and substrates.

2.3 INSULATION FASTENERS

- A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of thickness indicated securely in position indicated with self-locking washer in place; and complying with the following requirements:
1. Products:
 - a. AGM Industries, Inc.; Series T TACTOO Insul-Hangers.
 - b. Eckel Industries of Canada; Stic-Klip Type N Fasteners.
 - c. Gemco; Spindle Type.
 2. Plate: Perforated galvanized carbon-steel sheet, 0.030 inch (0.762 mm) thick by 2 inches (50 mm) square.
 3. Spindle: Copper-coated, low carbon steel; fully annealed; 0.105 inch (2.67 mm) in diameter; length to suit depth of insulation indicated.
- B. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- (0.41-mm-) thick galvanized steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches (38 mm) square or in diameter.
1. Products:
 - a. AGM Industries, Inc.; RC150.
 - b. AGM Industries, Inc.; SC150.
 - c. Gemco; Dome-Cap.
 - d. Gemco; R-150.
 - e. Gemco; S-150.
 2. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap.
- C. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates indicated without damaging insulation, fasteners, and substrates.
1. Products:
 - a. AGM Industries, Inc.; TACTOO Adhesive.
 - b. Eckel Industries of Canada; Stic-Klip Type S Adhesive.
 - c. Gemco; Tuff Bond Hanger Adhesive.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's instructions applicable to products and application indicated. If printed instructions are not available or do not apply to project conditions, consult manufacturer's technical representative for specific recommendations before proceeding with installation of insulation.

- B. Extend insulation full thickness as indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions, and fill voids with insulation. Remove projections that interfere with placement.
- C. Install acoustical insulation batts in all stud partition walls. Install batts prior to installing gypsum panels unless batts are readily installed after panels have been installed on one side.

3.2 SCHEDULE

- A. General: When spaces are also scheduled for building thermal insulation, install insulation as specified in Section 07 2100 "Thermal Insulation".
 - 1. Interior Partitions: Install Sound Attenuation Batt, from floor to underside of deck as noted on Drawings.

- END OF SECTION -

- SECTION 09 9113 -**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. This Section includes surface preparation and field painting of the following:
1. Exposed exterior items and surfaces.
 2. Surface preparation of new surfaces, priming, and finish coats specified in this Section are in addition to prepping, shop priming and surface treatment specified in other Sections.
- B. Paint exposed surfaces, except where the paint schedules indicate that a surface or material is not to be painted or is to remain natural. If the paint schedules do not specifically mention an item or a surface, paint the item or surface the same as similar adjacent materials or surfaces whether or not schedules indicate colors. If the schedules do not indicate color or finish, the Owner's Representative will select from standard colors and finishes available.
1. Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron work, and primed metal surfaces of mechanical and electrical equipment.
 2. Painting includes exposed concrete foundation from below grade up to siding.
- C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.
1. Prefinished items include the following factory-finished components:
 - a. Acoustical panels.
 - b. Metal toilet enclosures.
 - c. Metal lockers.
 - d. Finished mechanical and electrical equipment.
 - e. Light fixtures.
 - f. Distribution cabinets.
 2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:
 - a. Foundation spaces.
 - b. Furred areas.

- c. Ceiling plenums.
 - d. Utility tunnels.
 - e. Pipe spaces.
 - f. Duct shafts.
3. Finished metal surfaces include the following:
 - a. Anodized aluminum.
 - b. Stainless steel.
 - c. Chromium plate.
 - d. Copper.
 - e. Bronze and brass.
 4. Operating parts include moving parts of operating equipment and the following:
 - a. Valve and damper operators.
 - b. Linkages.
 - c. Sensing devices.
 - d. Motor and fan shafts.
 5. Labels: Do not paint over Underwriters Laboratories (UL), Factory Mutual (FM), or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

1.3 RELATED SECTIONS

- A. Section 01 74 19 "Materials Recycling & Waste Management".
- B. Section 01 81 13 "LEED Certification Requirements".
- C. Section 09 9600 "High-Performance Coatings".

1.4 DEFINITIONS

- A. General: Standard coating terms defined in ASTM D 16 apply to this Section.
- B. MPI: The Master Painters Institute, Approved Product List-2005

1.5 SUBMITTALS

- A. Product Data: For each paint system specified. Include block fillers and primers.
 1. Material List: Provide an inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
 2. Manufacturer's Information: Provide manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material proposed for use.
- B. Samples for Verification: Of each color and material to be applied, with texture to simulate actual conditions, on representative Samples of the actual substrate.

1. Provide Samples of each color defining each separate coat, including block fillers and primers. Use representative colors when preparing Samples for review. Resubmit until required sheen, color, and texture are achieved.
- C. LEED Submittal: See Section 018113 LEED Certification Requirements for the following:
1. MRc4 Recycled Content: Product data for products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content.
 - a. Include cost information for each product having recycled content.
 2. MRc5 Regional Materials:
 - a. Sourcing location(s): indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery from the project site.
 - b. Manufacturing location(s): indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
 - c. Product Value: indicate dollar value of product containing regional materials; include materials costs only.
 - d. Product Component(s) Value: Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.
- D. At completion of Work of this Section, submit manufacturer's or distributors numbered invoices showing type and quantity of products used on this Project.

1.6 QUALITY ASSURANCE

- A. MPI Standards:
1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."
 2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated for new construction and re-finished surfaces.
- B. Source Limitations: Obtain block fillers, primers, and undercoat materials for each coating system from the same manufacturer as the finish coats.
- C. Coordination of Work: Review other sections in which primers are provided to ensure compatibility of the total systems for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
1. Notify Project Manager of problems anticipated using the materials specified.
- D. Field Samples: Provide a full-coat benchmark finish sample of each type of coating and substrate required on the Project. Comply with procedures specified in PDCA P5. Duplicate finish of approved prepared samples.

1. The Project Manager will select one room or surface to represent surfaces and conditions for each type of coating and substrate to be painted. Apply coatings in this room or surface in accordance with the schedule or as specified. After finishes are accepted, this room or surface will be used for evaluation of coating systems of a similar nature.
- E. Material Quality: Provide the manufacturer's best quality, top of the line paint material of the various coating types specified. Paint material containers not displaying manufacturer's product identification will not be acceptable.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to the Project Site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label, and the following information:
- B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of **45 deg F**. Maintain containers used in storage in a clean condition, free of foreign materials and residue.
 1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

1.8 PROJECT CONDITIONS

- A. Apply water-based paints only when the temperature of surfaces to be painted and surrounding air temperatures are between **50 and 90 deg F**.
- B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are between **45 and 95 deg F**.
- C. Do not apply paint in snow, rain, fog, or mist; or when the relative humidity exceeds 85 percent; or at temperatures less than **5 deg F** above the dew point; or to damp or wet surfaces.
 1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.

1.9 EXTRA MATERIALS

- A. Furnish extra paint materials from the same production run as the materials applied in the quantities described below. Package paint materials in unopened, factory-sealed containers for storage and identify with labels describing contents. Deliver extra materials to the Owner.
- B. Quantity: Furnish the Owner with 10 gallons of each color or type applied. Containers must be delivered unopened

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. MATERIALS Basis-of-Design Product: The design is based on Kelly-Moore Paints, San Carlos, CA, tel: (888) 677-2468, www.kellymoore.com and Rustoleum distributed by Kelly-Moore Paints. District Standards – No substitutions allowed.

2.2 PAINT MATERIALS, GENERAL

- A. Material Compatibility: Provide block fillers, primers, undercoats, and finish-coat materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with the Applicator present, under which painting will be performed for compliance with paint application requirements.
 - 1. Do not begin to apply paint until unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
 - 2. Start of painting will be construed as the Applicator's acceptance of surfaces and conditions within a particular area.

3.2 PREPARATION

- A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of the size or weight of the item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.
- B. Cleaning: Before applying paint or other surface treatments, clean the substrates of substances that could impair the bond of the various coatings. Remove oil and grease before cleaning.
 - 1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
 - a. Clean all exterior surfaces to be refinished of all dirt, dust, oil, grease, oxidized loose and scaly paint film, mildew, rust on metal and other foreign substances.
- C. Repairs: Repair all cracks, holes and voids in surfaces to be refinished with suitable and matching repair compounds to insure permanency to the surfaces compatible to the painting systems to follow. Fill, float, sand and texture to match adjacent surfaces. Allow repair compounds to fully dry prior to priming and applying final coats of paint.

- D. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.
1. Provide barrier coats over incompatible primers or remove and reprime.
 2. Cementitious Materials: Prepare concrete, concrete masonry block, cement plaster, and mineral-fiber-reinforced cement panel surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.
 - a. Use abrasive blast-cleaning methods if recommended by paint manufacturer.
 - b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not paint surfaces where moisture content exceeds that permitted in manufacturer's written instructions.
 3. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with the Steel Structures Painting Council's (SSPC) recommendations.
 - a. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
 - b. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with the same primer as the shop coat.
 4. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.
- E. Materials Preparation: Mix and prepare paint materials according to manufacturer's written instructions.
1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
 2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
 3. Use only thinners approved by paint manufacturer and only within recommended limits.

3.3 APPLICATION

- A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.
1. Paint colors, surface treatments, and finishes: Refer to Drawings.
 2. Provide finish coats that are compatible with primers used.
 3. 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.
 4. The number of coats and film thickness required is the same regardless of the application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. Sand between applications where sanding is required to produce an even smooth surface in accordance with the manufacturer's directions.

5. Apply additional coats when undercoats, stains, or other conditions show through final coat of paint until paint film is of uniform finish, color, and appearance. Give special attention to ensure that surfaces, including edges, corners, crevices, welds, and exposed fasteners, receive a dry film thickness equivalent to that of flat surfaces.
 6. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, convector covers, covers for finned-tube radiation, grilles, and similar components are in place. Extend coatings in these areas, as required, to maintain the system integrity and provide desired protection.
 7. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before the final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 8. Paint surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
 9. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
 10. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.
- B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
- C. Minimum Coating Thickness: Apply paint materials no thinner than manufacturers recommended spreading rate. Provide the total dry film thickness of the entire system as recommended by the manufacturer and specified.
- D. Structural Steel: Painting of structural steel includes the structural steel posts at the roof top mechanical screen.
- E. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and in occupied spaces.
1. Mechanical items to be painted include, but are not limited to, the following:
 - a. Piping, pipe hangers, and supports.
 - b. Heat exchangers.
 - c. Tanks.
 - d. Ductwork.
 - e. Motors and mechanical equipment.
 - f. Accessory items.
 2. Electrical items to be painted include, but are not limited to, the following:
 - a. Conduit and fittings.
 - b. Switchgear.
 - c. Panelboards.
- F. Prime Coats: Before applying finish coats, apply a prime coat of material, as recommended by the manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn through or other defects due to insufficient sealing.

- G. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.
- H. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not in compliance with specified requirements.

3.4 CLEANING

- A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from the site.
 - 1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping. Be careful not to scratch or damage adjacent finished surfaces.

3.5 PROTECTION

- A. Protect unpainted surfaces, lawns, shrubbery and adjacent surfaces against paint and damage. Repair damage resulting from inadequate protection.
- B. Furnish sufficient drop cloths, shields, and protective equipment to prevent overspray or splatter from damaging surfaces not being painted.
- C. Protect work of other trades, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Project Manager.
- D. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.
 - 1. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA Standard P1-92 "Touch-Up Painting and Damage Repair – Financial Responsibility".

3.6 EXTERIOR PAINT SCHEDULE

- A. Metal Surfaces: Non-Ferrous Metals and Zinc-Coated (Galvanized) Steel.
 - 1. Semigloss Acrylic-Enamel Finish: Two finish coats over a primer.
 - a. Primer: Exterior aluminum primer under acrylic finishes.
 - b. Finish Coats: Exterior semigloss 100% acrylic enamel.
 - c. System DFT: 1.5 mils, (excluding existing or touch up primer)
- B. Metal Surfaces: Ferrous Metals.
 - 1. Ferrous Metals - Uncoated:
 - a. Semigloss Acrylic-Enamel Finish: Two finish coats over a rust-inhibitive primer.
 - b. Primer: Exterior ferrous-metal primer.
 - c. Finish Coats: Exterior semigloss acrylic enamel.
 - d. System DFT: 1.5 mils, (excluding existing or touch up primer)

3.7 CLEANING AND PROTECTION

- A. During course of work, remove discarded coating materials, rubbish, cans, rags and similar construction waste from the site at the end of each workday.
- B. Upon completion of the coating work, clean window glass or other coating splattered surfaces. Protect work of other trades, whether to be coated or not, against damage by coating and finishing work. Correct any damage by cleaning, repairing or replacing, and recoating, as acceptable to the Owner's Representative.

- END OF SECTION -

- SECTION 09 9123 -**INTERIOR PAINTING**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. This Section includes surface preparation and field painting of the following:
1. Exposed interior items and surfaces.
 2. Surface preparation of new surfaces, priming, and finish coats specified in this Section are in addition to prepping, shop priming and surface treatment specified in other Sections.
- B. Paint exposed surfaces, except where the paint schedules indicate that a surface or material is not to be painted or is to remain natural. If the paint schedules do not specifically mention an item or a surface, paint the item or surface the same as similar adjacent materials or surfaces whether or not schedules indicate colors. If the schedules do not indicate color or finish, the Owner's Representative will select from standard colors and finishes available.
1. Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron work, and primed metal surfaces of mechanical and electrical equipment.
 2. Painting includes exposed concrete foundation from below grade up to siding.
- C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.
1. Prefinished items include the following factory-finished components:
 - a. Acoustical panels.
 - b. Metal toilet enclosures.
 - c. Metal lockers.
 - d. Finished mechanical and electrical equipment.
 - e. Light fixtures.
 - f. Distribution cabinets.
 2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:
 - a. Foundation spaces.
 - b. Furred areas.

- c. Ceiling plenums.
 - d. Utility tunnels.
 - e. Pipe spaces.
 - f. Duct shafts.
3. Finished metal surfaces include the following:
 - a. Anodized aluminum.
 - b. Stainless steel.
 - c. Chromium plate.
 - d. Copper.
 - e. Bronze and brass.
 4. Operating parts include moving parts of operating equipment and the following:
 - a. Valve and damper operators.
 - b. Linkages.
 - c. Sensing devices.
 - d. Motor and fan shafts.
 5. Labels: Do not paint over Underwriters Laboratories (UL), Factory Mutual (FM), or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

1.3 RELATED SECTIONS

- A. Section 01 74 19 "Materials Recycling & Waste Management".
- B. Section 01 81 13 "LEED Certification Requirements".
- C. Section 09 9600 "High-Performance Coatings" for interior special paint coatings for floors and other applications.

1.4 DEFINITIONS

- A. General: Standard coating terms defined in ASTM D 16 apply to this Section.
- B. MPI: The Master Painters Institute, Approved Product List-2005

1.5 SUBMITTALS

- A. Product Data: For each paint system specified. Include block fillers and primers.
 1. Material List: Provide an inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
 2. Manufacturer's Information: Provide manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material proposed for use.

- B. Samples for Verification: Of each color and material to be applied, with texture to simulate actual conditions, on representative Samples of the actual substrate.
1. Provide Samples of each color defining each separate coat, including block fillers and primers. Use representative colors when preparing Samples for review. Resubmit until required sheen, color, and texture are achieved.
- C. LEED Submittal: See Section 018113 LEED Certification Requirements for the following:
1. Product Data for Credit EQ 4.2: For paints, including printed statement of VOC content and chemical components.
 2. MRc4 Recycled Content: Product data for products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content.
 - a. Include cost information for each product having recycled content.
 3. MRc5 Regional Materials:
 - a. Sourcing location(s): indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery from the project site.
 - b. Manufacturing location(s): indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
 - c. Product Value: indicate dollar value of product containing regional materials; include materials costs only.
 - d. Product Component(s) Value: Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.
- D. At completion of Work of this Section, submit manufacturer's or distributors numbered invoices showing type and quantity of products used on this Project.

1.6 QUALITY ASSURANCE

- A. MPI Standards:
1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."
 2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated for new construction and re-finished surfaces.
- B. Source Limitations: Obtain block fillers, primers, and undercoat materials for each coating system from the same manufacturer as the finish coats.
- C. Coordination of Work: Review other sections in which primers are provided to ensure compatibility of the total systems for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
1. Notify Project Manager of problems anticipated using the materials specified.

- D. Field Samples, Interior: Provide a full-coat benchmark finish sample of each type of coating and substrate required on the Project. Comply with procedures specified in PDCA P5. Duplicate finish of approved prepared samples.
 - 1. The Project Manager will select one room or surface to represent surfaces and conditions for each type of coating and substrate to be painted. Apply coatings in this room or surface in accordance with the schedule or as specified. After finishes are accepted, this room or surface will be used for evaluation of coating systems of a similar nature.
- E. Material Quality: Provide the manufacturer's best quality, top of the line paint material of the various coating types specified. Paint material containers not displaying manufacturer's product identification will not be acceptable.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to the Project Site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label, and the following information:
- B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of **45 deg F**. Maintain containers used in storage in a clean condition, free of foreign materials and residue.
 - 1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

1.8 PROJECT CONDITIONS

- A. Apply water-based paints only when the temperature of surfaces to be painted and surrounding air temperatures are between **50 and 90 deg F**.
- B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are between **45 and 95 deg F**.
- C. Do not apply paint in snow, rain, fog, or mist; or when the relative humidity exceeds 85 percent; or at temperatures less than **5 deg F** above the dew point; or to damp or wet surfaces.
 - 1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.

1.9 EXTRA MATERIALS

- A. Furnish extra paint materials from the same production run as the materials applied in the quantities described below. Package paint materials in unopened, factory-sealed containers for storage and identify with labels describing contents. Deliver extra materials to the Owner.
- B. Quantity: Furnish the Owner with 10 gallons of each color or type applied. Containers must be delivered unopened

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. MATERIALS Basis-of-Design Product: The design is based on Kelly-Moore Paints, San Carlos, CA, tel: (888) 677-2468, www.kellymoore.com and Rustoleum distributed by Kelly-Moore Paints. District Standards – No substitutions allowed.

2.2 PAINT MATERIALS, GENERAL

- A. Material Compatibility: Provide block fillers, primers, undercoats, and finish-coat materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with the Applicator present, under which painting will be performed for compliance with paint application requirements.
 - 1. Do not begin to apply paint until unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
 - 2. Start of painting will be construed as the Applicator's acceptance of surfaces and conditions within a particular area.

3.2 PREPARATION

- A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of the size or weight of the item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.
- B. Cleaning: Before applying paint or other surface treatments, clean the substrates of substances that could impair the bond of the various coatings. Remove oil and grease before cleaning.
 - 1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
 - a. Clean all interior surfaces to be refinished of all dirt, dust, oil, grease, oxidized loose and scaly paint film, mildew, rust on metal and other foreign substances.
- C. Repairs: Repair all cracks, holes and voids in surfaces to be refinished with suitable and matching repair compounds to insure permanency to the surfaces compatible to the painting systems to follow. Fill, float, sand and texture to match adjacent surfaces. Allow repair compounds to fully dry prior to priming and applying final coats of paint.

- D. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.
1. Provide barrier coats over incompatible primers or remove and reprime.
 2. Cementitious Materials: Prepare concrete, concrete masonry block, cement plaster, and mineral-fiber-reinforced cement panel surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.
 - a. Use abrasive blast-cleaning methods if recommended by paint manufacturer.
 - b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not paint surfaces where moisture content exceeds that permitted in manufacturer's written instructions.
 3. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with the Steel Structures Painting Council's (SSPC) recommendations.
 - a. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
 - b. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with the same primer as the shop coat.
 4. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.
- E. Materials Preparation: Mix and prepare paint materials according to manufacturer's written instructions.
1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
 2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
 3. Use only thinners approved by paint manufacturer and only within recommended limits.

3.3 APPLICATION

- A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.
1. Paint colors, surface treatments, and finishes: Refer to Drawings.
 2. Provide finish coats that are compatible with primers used.
 3. 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.
 4. The number of coats and film thickness required is the same regardless of the application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. Sand between applications where sanding is required to produce an even smooth surface in accordance with the manufacturer's directions.

5. Apply additional coats when undercoats, stains, or other conditions show through final coat of paint until paint film is of uniform finish, color, and appearance. Give special attention to ensure that surfaces, including edges, corners, crevices, welds, and exposed fasteners, receive a dry film thickness equivalent to that of flat surfaces.
 6. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, convector covers, covers for finned-tube radiation, grilles, and similar components are in place. Extend coatings in these areas, as required, to maintain the system integrity and provide desired protection.
 7. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before the final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 8. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
 9. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
 10. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.
- B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
- C. Minimum Coating Thickness: Apply paint materials no thinner than manufacturers recommended spreading rate. Provide the total dry film thickness of the entire system as recommended by the manufacturer and specified.
- D. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and in occupied spaces.
1. Mechanical items to be painted include, but are not limited to, the following:
 - a. Piping, pipe hangers, and supports.
 - b. Heat exchangers.
 - c. Tanks.
 - d. Ductwork.
 - e. Motors and mechanical equipment.
 - f. Accessory items.
 2. Electrical items to be painted include, but are not limited to, the following:
 - a. Conduit and fittings.
 - b. Switchgear.
 - c. Panelboards.
- E. Prime Coats: Before applying finish coats, apply a prime coat of material, as recommended by the manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn through or other defects due to insufficient sealing.
- F. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

- G. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- H. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not in compliance with specified requirements.

3.4 CLEANING

- A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from the site.
 - 1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping. Be careful not to scratch or damage adjacent finished surfaces.

3.5 PROTECTION

- A. Protect unpainted surfaces, lawns, shrubbery and adjacent surfaces against paint and damage. Repair damage resulting from inadequate protection.
- B. Furnish sufficient drop cloths, shields, and protective equipment to prevent overspray or splatter from damaging surfaces not being painted.
- C. Protect work of other trades, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Project Manager.
- D. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.
 - 1. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA Standard P1-92 "Touch-Up Painting and Damage Repair – Financial Responsibility".

3.6 INTERIOR PAINT SCHEDULE

- A. Plaster & Gypsum Wallboard Walls and Ceilings:

Primer Coat	Acry-Plex PVA primer/sealer	971
2 Coats	Dura-Poxy + 100% Acrylic Eggshell Enamel	1686
- B. Plaster & Gypsum Wallboard Walls and Ceilings at wet and special designated areas:

Primer Coat	Acry-Plex PVA primer/sealer	971
2 Coats	Dura-Poxy + 100% Acrylic Semi-Gloss Enamel	1685
- C. Interior Metals:

Primer Coat	Acry-Shield 100% Acrylic Metal Primer	1725
2 Coats	Dura-Poxy + 100% Acrylic Semi-Gloss Enamel	1685

3.7 CLEANING AND PROTECTION

- A. During course of work, remove discarded coating materials, rubbish, cans, rags and similar construction waste from the site at the end of each workday.

- B. Upon completion of the coating work, clean window glass or other coating splattered surfaces. Protect work of other trades, whether to be coated or not, against damage by coating and finishing work. Correct any damage by cleaning, repairing or replacing, and recoating, as acceptable to the Owner's Representative.

- END OF SECTION -

- SECTION 09 9600 -**HIGH PERFORMANCE COATINGS**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. This Section includes surface preparation and painting of the following:
 - 1. Interior sealed concrete where shown on plans.

1.3 RELATED SECTIONS

- A. Section 01 74 19 "Materials Recycling & Waste Management".
- B. Section 01 81 13 "LEED Certification Requirements".
- C. Section 09 9113 "Exterior Painting" for painting of exposed exterior metals (ferrous and non-ferrous).

1.4 SUBMITTALS

- A. Product Data: For each coating system indicated. Include block fillers and primers.
 - 1. Material List: An inclusive list of required coating materials. Indicate each material and cross-reference the specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
 - 2. Manufacturer's Information: Manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each material specified.
- B. Certification by manufacturer that products supplied comply with requirements indicated that limit the amount of VOCs in coating products.
- C. Samples for Verification: Of each color and material to be applied, with texture to simulate actual condition, on representative samples of the actual substrate.
 - 1. Submit samples on the following substrates for Architect's review of color and texture:
 - a. Concrete: Provide two **4-inch- (100-mm-)** square samples for each color and finish.

- D. At completion of Work of this Section, submit manufacturer's or distributor's numbered invoices showing type and quantity of products used on this Project.
- E. LEED Submittals: See Section 018113 LEED Certification Requirements for the following:
 - 1. Product Data for Credit EQ 4.2: For coatings, including printed statement of VOC content and chemical components.
 - 2. MRc4 Recycled Content: Product data for products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content.
 - a. Include cost information for each product having recycled content.
 - 3. MRc5 Regional Materials:
 - a. Sourcing location(s): indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery from the project site.
 - b. Manufacturing location(s): indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
 - c. Product Value: indicate dollar value of product containing regional materials; include materials costs only.
 - d. Product Component(s) Value: Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.

1.5 QUALITY ASSURANCE

- A. Applicator Qualifications: Engage an experienced applicator who has completed high-performance coating system applications similar in material and extent to those indicated for Project and whose work has a record of successful in-service performance.
- B. Source Limitations: Obtain primers and undercoat materials for each coating system from the same manufacturer as the finish coats.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label with the following information:
- B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F. Maintain containers used in storage in a clean condition, free of foreign materials and residue.
 - 1. Protect materials from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and applying coatings.

1.7 PROJECT CONDITIONS

- A. Apply coatings only when temperature of surfaces to be coated and surrounding air temperatures are between 45 and 95 deg F or manufacturers recommendations.

HIGH PERFORMANCE COATINGS

- B. Do not apply coatings 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.
 - 1. Allow wet surfaces to dry thoroughly and attain temperature and conditions specified before proceeding with or continuing coating operation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide one of the products indicated in the coating system descriptions.
 - 1. Carboline Company (Carboline).
 - 2. ICI Dulux Paints; Devoe Coatings (ICI).
 - 3. Pittsburgh Paint; PPG Industries, Inc. (PPG).
 - 4. Tnemec Company, Inc.
 - 5. General Polymers, a Sherwin Williams Company.

2.2 COATINGS MATERIALS, GENERAL

- A. Material Compatibility: Provide primers, undercoats, and finish-coat materials that are compatible with one another and substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
- B. Material Quality: Provide manufacturer's highest grade of the various high-performance coatings specified. Materials not displaying manufacturer's product identification are not acceptable.
 - 1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.
- C. VOC Classification: Provide high-performance coating materials, including primers, undercoats, and finish-coat materials, that have a VOC classification of 250 g/L or less.

2.3 COLORS

- A. Colors: Refer to Drawings.

2.4 INTERIOR HIGH-PERFORMANCE COATING SYSTEMS

- A. Concrete Floors: Provide the following finish systems over interior concrete surfaces where indicated:
 - 1. Moderate environments for mild environments with low-gloss finish: One pigmented finish coat over a primer.
 - a. Primer: Acrylic primer applied at spreading rate recommended by manufacturer.
 - 1) Carboline: Carboguard 1340 Poly – Amine Epoxy.

- 2) ICI: Devflex 4020 DTM Flat Interior/Exterior Waterborne Primer and Finish.
 - 3) PPG: 6-603 Speedhide Interior/Exterior Acrylic Latex Alkali Resistant Primer.
 - 4) Tnemec: Series 29 Tufcryn Acrylic Emulsion.
- b. Topcoat: Semigloss acrylic emulsion applied at spreading rate recommended by manufacturer to achieve a dry film thickness of **1.5 to 4.0 mils (0.038 to 0.102 mm)**.
- 1) Carbolite: Sanitile 945 Epoxy Coating.
 - 2) ICI: Devflex 4206 Interior/Exterior Waterborne Acrylic Semigloss Enamel.
 - 3) PPG: 90-4XX Series Pitt-Tech One Pack Interior/Exterior High Performance Waterborne Satin DTM Industrial Enamel.
 - 4) Tnemec: Series 29 Tufcryn Acrylic Emulsion.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. With Applicator present, examine substrates and conditions under which high-performance coatings will be applied, for compliance with coating application requirements.
1. Apply coatings only after unsatisfactory conditions have been corrected and surfaces to receive coatings are thoroughly dry.
 2. Start of application is construed as Applicator's acceptance of surfaces within that particular area.
- B. Coordination of Work: Review other Sections in which primers or other coatings are provided to ensure compatibility of total systems for various substrates. On request, furnish information on characteristics of specified finish materials to ensure compatible primers.

3.2 PREPARATION

- A. General: Remove plates, machined surfaces, and similar items already in place that are not to be coated. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and coating.
1. After completing coating operations, reinstall items that were removed; use workers skilled in the trades involved.
- B. Cleaning: Before applying high-performance coatings, clean substrates of substances that could impair bond of coatings. Remove oil and grease before cleaning.
1. Schedule cleaning and coating application so dust and other contaminants from cleaning process will not fall on wet, newly coated surfaces.
- C. Surface Preparation: Clean and prepare surfaces to be coated according to manufacturer's written instructions for each substrate condition and as specified.
1. Provide barrier coats over incompatible primers or remove primers and reprime substrate.

2. Cementitious Substrates: Prepare concrete, brick, concrete masonry block, and cement plaster surfaces to be coated. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods to prepare surfaces.
 - a. Use abrasive blast-cleaning methods if recommended by coating manufacturer.
 - b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not coat surfaces if moisture content exceeds that permitted in manufacturer's written instructions
- D. Material Preparation: Carefully mix and prepare coating materials according to manufacturer's written instructions.
1. Maintain containers used in mixing and applying coatings in a clean condition, free of foreign materials and residue.
 2. Stir materials before applying to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into the material. Remove film and, if necessary, strain coating material before using.
 3. Use only the type of thinners approved by manufacturer and only within recommended limits.
 4. Coating colors, surface treatments, and finishes are indicated in the coating system descriptions.
 5. Provide finish coats compatible with primers used.
 6. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, convector covers, grilles, covers for finned-tube radiation, and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.
 - a. Coat surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before final installation, coat surfaces behind permanently fixed equipment or furniture with prime coat only.
- E. Scheduling Coating: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for coating as soon as practicable after preparation and before subsequent surface deterioration.
1. The number of coats and film thickness required is the same regardless of application method.
 - a. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer.
 - b. Where manufacturer's written instructions require sanding, sand between applications to produce a smooth, even surface.
 - c. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until coating has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and application of another coat does not cause undercoat to lift or lose adhesion.
 2. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance. Give special attention to edges, corners, crevices, welds, exposed fasteners, and similar surfaces to ensure that they receive a dry film thickness equivalent to that of flat surfaces.

- F. Application Procedures: Apply coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.
 - 1. Brush Application: Use brushes best suited for material applied and of appropriate size for the surface or item being coated.
 - a. Apply primers and first coats by brush unless manufacturer's written instructions permit using roller or mechanical applicators.
 - b. Brush out and work brush coats into surfaces in an even film.
 - c. Eliminate cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Neatly draw glass lines and color breaks.
 - 2. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by manufacturer for the material and texture required.
 - 3. Spray Equipment: Use mechanical methods to apply coating if permitted by manufacturer's written instructions and governing regulations.
 - a. Use spray equipment with orifice size recommended by manufacturer for material and texture required.
 - b. Apply each coat to provide the equivalent hiding of brush-applied coats.
 - c. Do not double back with spray equipment building-up film thickness of two coats in one pass, unless recommended by manufacturer.
- G. Minimum Coating Thickness: Apply each material no thinner than manufacturer's recommended spreading rate. Provide total dry film thickness of the entire system as recommended by manufacturer.
- H. Prime Coats: Before applying finish coats, apply a prime coat of material, as recommended by manufacturer, to material required to be coated or finished that has not been prime coated by others.
 - 1. Recoat primed and sealed substrates if there is evidence of suction spots or unsealed areas in first coat, to ensure a finish coat with no burn-through or other defects caused by insufficient sealing.
- I. Completed Work: Match approved Samples for color, texture, and coverage. Remove, refinish, or recoat work that does not comply with specified requirements.

3.3 APPLICATION

- A. General: Apply high-performance coatings according to manufacturer's written instructions.
 - 1. Use applicators and techniques best suited for the material being applied.
 - 2. Do not apply high-performance coatings over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to forming a durable coating film.
 - 3. Apply second coat only after the first coat is thoroughly dry.

3.4 CLEANING

- A. Cleanup: At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
 - 1. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

HIGH PERFORMANCE COATINGS

3.5 PROTECTION

- A. Protect work of other trades, whether being coated or not, against damage from coating operation. Correct damage by cleaning, repairing, replacing, and recoating, as approved by Architect, and leave in an undamaged condition.
 - 1. Provide "Wet Paint" signs to protect newly coated finishes. After completing coating operations, remove temporary protective wrappings provided by others to protect their work.
 - 2. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces. Comply with procedures specified in PDCA P1.

- END OF SECTION -

