

Attachment 2a

Division 2-14

Technical Specifications

SECTION 024116 – DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Demolition and removal of buildings and site improvements.
2. Removing below-grade construction.
3. Disconnecting, capping or sealing, and removing site utilities.

B. Related Requirements:

1. Section 011000 "Summary" for use of the premises and phasing requirements.
2. Section 013200 "Construction Progress Documentation" for preconstruction photographs taken before building demolition.
3. Section 311000 "Site Clearing" for site clearing and removal of above- and below-grade site improvements not part of building demolition.
4. Appendix "D" for Environmental Abatement requirements

1.2 DEFINITIONS

A. ACM: Asbestos-containing material.

B. Demolition: Dismantling, razing, destroying, or wrecking of any fixed building or structure or any part thereof.

C. Modify: Provide all necessary material and labor to modify an existing item to the condition indicated or specified.

D. Salvage/Salvageable: Remove and deliver, to the specified location(s), the equipment, building materials, or other items so identified to be saved from destruction, damage, or waste; such property to remain that of Owner. Unless otherwise specified, title to items identified for demolition shall revert to Contractor.

E. Universal Waste Lamp: In accordance with 40 CFR 273, the bulb or tube portion of an electric lighting device, examples of which include, but are not limited to, fluorescent, high-intensity discharge, neon, mercury vapor, high-pressure sodium, and metal halide lamps.

F. Universal Waste Thermostat: A temperature control device that contains metallic mercury in an ampule attached to a bimetal sensing element, and mercury-containing ampules that have been removed from these temperature control devices in compliance with the requirements of 40 CFR 273.

1.3 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. American National Standards Institute (ANSI): A10.6, Safety Requirements for Demolition Operations.
2. Occupational Safety and Health Administration (OSHA), U.S. Code of Federal Regulations (CFR) Title 29 Part 1926—Occupational Safety and Health Regulations for Construction.
3. Environmental Protection Agency (EPA), U.S. Code of Federal Regulations (CFR), Title 40:

- a. Part 61—National Emission Standards for Hazardous Air Pollutants.
- b. Part 82—Protection of Stratospheric Ozone.
- c. Part 273—Standards for Universal Waste Management.

1.4 SUBMITTALS

A. Informational Submittals:

1. Submit proposed Demolition Plan, in accordance with requirements specified herein, for approval before such Work is started.
2. Submit copies of any notifications, authorizations and permits required to perform the Work.
3. Submit a shipping receipt or bill of lading for all containers of ACM shipped.
4. Submit results of any field investigations to the Owner and/or representative denoting investigative work performed and results.
5. Qualification Data: For refrigerant recovery technician.
6. Engineering Survey: Submit engineering survey of condition of building.
7. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control and for noise control. Indicate proposed locations and construction of barriers.
8. Adjacent Buildings: Detail special measures proposed to protect adjacent buildings to remain.
9. Pre demolition Photographs or Video: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by salvage and demolition operations. Comply with Section 013233 "Photographic Documentation." Submit before the Work begins.
10. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

1.5 REGULATORY AND SAFETY REQUIREMENTS

- A. When applicable, demolition Work shall be accomplished in strict accordance with 29 CFR 1926-Subpart T.
- B. Comply with federal, state, and local hauling and disposal regulations. In addition to the requirements of the General Conditions, Contractor's safety requirements shall conform to ANSI A10.6.
- C. Furnish timely notification of this demolition project to applicable federal, state, regional, and local authorities in accordance with 40 CFR 61-Subpart M.

1.6 DEMOLITION PLAN

- A. Demolition Plan shall provide for safe conduct of the Work and shall include:
 1. Detailed description of methods and equipment to be used for each operation;
 2. The Contractor's planned sequence of operations, including coordination with other work in progress;
 3. Written requirements and controls for protecting personnel and property;
 4. Written procedures for testing, controlling, handling, and disposing of all debris, including treated wood products used for waterfront structures or utility poles, and oil-filled transformers.
 5. Disconnection schedule of utility services.

6. Proposed Disposal Facilities: Name and letter of acceptance from disposal facilities proposed for disposal of debris.

1.7 SEQUENCING AND SCHEDULING

- A. The Work of this Specification shall not commence until Contractor's Demolition Plan has been approved by Engineer.

1.8 PREINSTALLATION MEETINGS

- A. Predemolition Conference: Conduct conference at Project site.
 1. Inspect and discuss condition of construction to be demolished.
 2. Review structural load limitations of existing structures.
 3. Review and finalize building demolition schedule and verify availability of demolition personnel, equipment, and facilities needed to make progress and avoid delays.
 4. Review and finalize protection requirements.
 5. Review procedures for noise control and dust control.
 6. Review procedures for protection of adjacent buildings.
 7. Review items to be salvaged and returned to Owner.

1.9 FIELD CONDITIONS

- A. Buildings to be demolished will be vacated and their use discontinued before start of the Work.
- B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- C. Hazardous Materials present in buildings and structures to be demolished: A report on the presence of hazardous materials is on file for review and use. Examine report to become aware of locations where hazardous materials are present.
 1. Hazardous material remediation is specified elsewhere in the Contract Documents.
 2. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.
 3. Owner will provide material safety data sheets for materials that are known to be present in buildings and structures to be demolished because of building operations or processes performed there.
- D. On-site storage or sale of removed items or materials is not permitted.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ANSI/ASSP A10.6 and NFPA 241.

2.2 SOIL MATERIALS

- A. Satisfactory Soils: Comply with requirements in Section 312000 "Earth Moving."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting demolition operations.
- B. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.
- C. Engage a professional engineer to perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during building demolition operations.
- D. Steel Tendons: Locate tensioned steel tendons and include recommendations for de-tensioning.
- E. Verify that hazardous materials have been remediated before proceeding with building demolition operations.
 - 1. Plaster materials within the Recreation Center and Annex buildings have been laboratory-confirmed to contain trace concentrations (<1%) of asbestos. This material is not, by definition, asbestos-containing material and is not regulated by the United States Environmental Protection Agency (EPA) or the City of Philadelphia Asbestos Control Regulation (ACR). However, asbestos is present in the plaster materials and the Occupational Safety and Health Administration's (OSHA) Occupational Exposure to Asbestos Standard (29 CFR 1926.1101) is applicable to work which disturbs or may disturb the material. Work operations conducted in areas where the asbestos or asbestos product is below one percent is an "unclassified" operation as stated by OSHA. As such, the employer shall follow the requirements in 29 CFR 1926.1101 including paragraphs (g)(1) [except (g)(1)(i)], (g)(2) and (g)(3) that describe engineering and work practice controls which shall be employed during any work operation which disturbs or may disturb plaster materials at the Site.
- F. Inventory and record the condition of items to be removed and salvaged.

3.2 PREPARATION

- A. Refrigerant: Before starting demolition, remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction.

3.3 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Utilities to Be Disconnected: Locate, identify, disconnect, and seal or cap off utilities serving buildings and structures to be demolished.
 - 1. Arrange to shut off utilities with utility companies.
 - 2. If removal, relocation, or abandonment of utility services will affect adjacent occupied buildings, then provide temporary utilities that bypass buildings and structures to be demolished and that maintain continuity of service to other buildings and structures.
 - 3. Do not start demolition work until utility disconnecting and sealing have been completed and verified in writing.

3.4 PROTECTION

- A. Existing Facilities: Protect adjacent walkways, loading docks, building entries, and other building facilities during demolition operations. Maintain exits from existing buildings.
- B. Temporary Shoring: Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent unexpected movement or collapse of construction being demolished.
 - 1. Strengthen or add new supports when required during progress of demolition.
- C. Existing Utilities to Remain: Maintain utility services to remain and protect from damage during demolition operations.
 - 1. Do not interrupt existing utilities serving adjacent occupied or operating facilities unless authorized in writing by Owner and authorities having jurisdiction.
- D. Temporary Protection: Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction and as indicated. Comply with requirements in Section 015000 "Temporary Facilities and Controls."
 - 1. Protect adjacent buildings and facilities from damage due to demolition activities.
 - 2. Protect existing site improvements, appurtenances, and landscaping to remain.
 - 3. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.
 - 4. Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
 - 5. Provide protection to ensure safe passage of people around building demolition area and to and from occupied portions of adjacent buildings and structures.
 - 6. Protect walls, windows, roofs, and other adjacent exterior construction that are to remain and that are exposed to building demolition operations.
 - 7. Erect and maintain dustproof partitions and temporary enclosures to limit dust, noise, and dirt migration to occupied portions of adjacent buildings.
- E. Remove temporary barriers and protections where hazards no longer exist. Where open excavations or other hazardous conditions remain, leave temporary barriers and protections in place.

3.5 DEMOLITION, GENERAL

- A. General: Demolish indicated buildings and site improvements completely. Use methods required to complete the Work within limitations of governing regulations and as follows:
 - 1. Do not use cutting torches until work area is cleared of flammable materials. Maintain portable fire-suppression devices during flame-cutting operations.
 - 2. Maintain fire watch during and for at least 12 hours after flame-cutting operations.
 - 3. Maintain adequate ventilation when using cutting torches.
 - 4. Locate building demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
- B. Site Access and Temporary Controls: Conduct building demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - 1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed trafficways if required by authorities having jurisdiction.

2. Use water mist and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations. Do not use water when it may damage adjacent construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.

C. Explosives: Use of explosives is not permitted.

3.6 DEMOLITION BY MECHANICAL MEANS

A. Proceed with demolition of structural framing members systematically, from higher to lower level. Complete building demolition operations above each floor or tier before disturbing supporting members on the next lower level.

B. Remove debris from elevated portions of the building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

1. Remove structural framing members and lower to ground by method suitable to minimize ground impact and dust generation.

C. Below-Grade Construction: Demolish foundation walls and other below-grade construction.

1. Remove below-grade construction, including basements, foundation walls, and footings, completely.

D. Existing Utilities: Demolish and remove existing utilities and below-grade utility structures.

3.7 SITE RESTORATION

A. Below-Grade Areas: Rough grade below-grade areas ready for further excavation or new construction.

B. Below-Grade Areas: Completely fill below-grade areas and voids resulting from building demolition operations with materials specified in Geotechnical Report and according to backfill requirements in Section 312000 "Earth Moving."

C. Site Grading: Uniformly rough grade area of demolished construction to a smooth surface, free from irregular surface changes. Provide a smooth transition between adjacent existing grades and new grades.

3.8 REPAIRS

A. Promptly repair damage to adjacent buildings caused by demolition operations.

3.9 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove demolition waste materials from Project site and recycle or dispose of them according to Section 017419 "Construction Waste Management and Disposal."

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Do not burn demolished materials.

3.10 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by building demolition operations. Return adjacent areas to condition existing before building demolition operations began.
 - 1. Clean roadways of debris caused by debris transport.

END OF SECTION

SECTION 031000 - CONCRETE FORMING AND ACCESSORIES

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. Form-facing material for cast-in-place concrete.
2. Form liners.
3. Insulating concrete forms.
4. Shoring, bracing, and anchoring.

- B. Related Requirements:

1. Section 321313 "Concrete Paving" for formwork related to concrete pavement and walks.
2. Section 321316 "Decorative Concrete Paving" for formwork related to decorative concrete pavement and walks.

1.3 DEFINITIONS

- A. Form-Facing Material: Temporary structure or mold for the support of concrete while the concrete is setting and gaining sufficient strength to be self-supporting.
- B. Formwork: The total system of support of freshly placed concrete, including the mold or sheathing that contacts the concrete, as well as supporting members, hardware, and necessary bracing.

1.4 ACTION SUBMITTALS

- A. Product Data: For each of the following:

1. Exposed surface form-facing material.
2. Concealed surface form-facing material.
3. Forms for cylindrical columns.
4. Pan-type forms.
5. Void forms.
6. Form liners.
7. Insulating concrete forms.
8. Form ties.

9. Waterstops.
 10. Form-release agent.
- B. Shop Drawings: Prepared by, and signed and sealed by, a qualified professional engineer responsible for their preparation, detailing fabrication, assembly, and support of forms.
1. For exposed vertical concrete walls, indicate dimensions and form tie locations.
 2. Indicate dimension and locations of construction and movement joints required to construct the structure in accordance with ACI 301.
 - a. Location of construction joints is subject to approval of the Architect.
 3. Indicate location of waterstops.
 4. Indicate form liner layout and form line termination details.
 5. Indicate proposed schedule and sequence of stripping of forms, shoring removal, and reshoring installation and removal.
 6. Indicate layout of insulating concrete forms, dimensions, course heights, form types, and details.
- C. Samples:
1. For waterstops.
 2. For Form Liners: 12-inch by 12-inch sample, indicating texture.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing and inspection agency.
- B. Research Reports: For insulating concrete forms indicating compliance with International Code Council Acceptance Criteria AC308.
- C. Field quality-control reports.
- D. Minutes of preinstallation conference.

1.6 QUALITY ASSURANCE

- A. Testing and Inspection Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.
- B. Mockups: Formed surfaces to demonstrate typical joints, surface finish, texture, tolerances, and standard of workmanship.
 1. Build panel approximately 100 sq. ft. in the location indicated or, if not indicated, as directed by Architect.
 2. Subject to compliance with requirements, approved mockups may become part of the completed Work.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Form Liners: Store form liners under cover to protect from sunlight.
- B. Insulating Concrete Forms: Store forms off ground and under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.
- C. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

2.1 PERFORMANCE REQUIREMENTS

- A. Concrete Formwork: Design, engineer, erect, shore, brace, and maintain formwork, shores, and reshores in accordance with ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads, so that resulting concrete conforms to the required shapes, lines, and dimensions.
 - 1. Design wood panel forms in accordance with APA's "Concrete Forming Design/Construction Guide."
 - 2. Design formwork to limit deflection of form-facing material to 1/240 of center-to-center spacing of supports.
 - a. For architectural concrete specified in Section 033300 "Architectural Concrete," limit deflection of form-facing material, studs, and walers to 0.0025 times their respective clear spans (L/400).
- B. Design, engineer, erect, shore, brace, and maintain insulating concrete forms in accordance with ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads, so that resulting concrete conforms to the required shapes, lines, and dimensions.
 - 1. Design cross ties to transfer the effects of the following loads to the cast-in-place concrete core:
 - a. Wind Loads: As indicated on Drawings.
 - 1) Horizontal Deflection Limit: Not more than 1/240 of the wall height.

2.2 FORM-FACING MATERIALS

- A. As-Cast Surface Form-Facing Material:
 - 1. Provide continuous, true, and smooth concrete surfaces.
 - 2. Furnish in largest practicable sizes to minimize number of joints.
 - 3. Acceptable Materials: As required to comply with Surface Finish designations specified in Section 033000 "Cast-In-Place Concrete, and as follows:
 - a. Plywood, metal, or other approved panel materials.
 - b. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
 - 1) APA HDO (high-density overlay).
 - 2) APA MDO (medium-density overlay); mill-release agent treated and edge sealed.
 - 3) APA Structural 1 Plyform, B-B or better; mill oiled and edge sealed.
 - 4) APA Plyform Class I, B-B or better; mill oiled and edge sealed.
- B. Concealed Surface Form-Facing Material: Lumber, plywood, metal, plastic, or another approved material.

1. Provide lumber dressed on at least two edges and one side for tight fit.

2.3 WATERSTOPS

- A. Self-Expanding Rubber Strip Waterstops: Manufactured rectangular or trapezoidal strip, bentonite-free hydrophilic polymer-modified chloroprene rubber, for adhesive bonding to concrete, 3/8 by 3/4 inch.

2.4 RELATED MATERIALS

- A. Reglets: Fabricate reglets of not less than 0.022-inch-thick, galvanized-steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.
- B. Dovetail Anchor Slots: Hot-dip galvanized-steel sheet, not less than 0.034 inch thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.
- C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.
- D. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.
- E. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.
 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
 2. Form release agent for form liners shall be acceptable to form liner manufacturer.
- F. Form Ties: Factory-fabricated, removable or snap-off, glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
 1. Furnish units that leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
 2. Furnish ties that, when removed, leave holes no larger than 1 inch in diameter in concrete surface.
 3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

3.1 INSTALLATION OF FORMWORK

- A. Comply with ACI 301.
- B. Construct formwork, so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117 and to comply with the Surface Finish designations specified in Section 033000 "Cast-In-Place Concrete" for as-cast finishes.
- C. Limit concrete surface irregularities as follows:
 1. Surface Finish-1.0: ACI 117 Class D, 1 inch.
 2. Surface Finish-2.0: ACI 117 Class B, 1/4 inch.
 3. Surface Finish-3.0: ACI 117 Class A, 1/8 inch.

- D. Construct forms tight enough to prevent loss of concrete mortar.
 - 1. Minimize joints.
 - 2. Exposed Concrete: Symmetrically align joints in forms.
- E. Construct removable forms for easy removal without hammering or prying against concrete surfaces.
 - 1. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces.
 - 2. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 - 3. Install keyways, reglets, recesses, and other accessories, for easy removal.
- F. Do not use rust-stained, steel, form-facing material.
- G. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces.
 - 1. Provide and secure units to support screed strips
 - 2. Use strike-off templates or compacting-type screeds.
- H. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible.
 - 1. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar.
 - 2. Locate temporary openings in forms at inconspicuous locations.
- I. Chamfer exterior corners and edges of permanently exposed concrete.
- J. At construction joints, overlap forms onto previously placed concrete not less than 12 inches.
- K. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work.
 - 1. Determine sizes and locations from trades providing such items.
 - 2. Obtain written approval of Architect prior to forming openings not indicated on Drawings.
- L. Construction and Movement Joints:
 - 1. Construct joints true to line with faces perpendicular to surface plane of concrete.
 - 2. Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 - 3. Place joints perpendicular to main reinforcement.
 - 4. Locate joints for beams, slabs, joists, and girders in the middle third of spans.
 - a. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.

5. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 6. Space vertical joints in walls as indicated on Drawings.
 - a. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
- M. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection.
1. Locate ports and openings in bottom of vertical forms, in inconspicuous location, to allow flushing water to drain.
 2. Close temporary ports and openings with tight-fitting panels, flush with inside face of form, and neatly fitted, so joints will not be apparent in exposed concrete surfaces.
- N. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- O. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- P. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 INSTALLATION OF EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete.
1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.
 3. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
 4. Install dovetail anchor slots in concrete structures, as indicated on Drawings.
 5. Clean embedded items immediately prior to concrete placement.

3.3 INSTALLATION OF WATERSTOPS

- A. Flexible Waterstops: Install in construction joints and at other joints indicated to form a continuous diaphragm.
1. Install in longest lengths practicable.
 2. Locate waterstops in center of joint unless otherwise indicated on Drawings.
 3. Allow clearance between waterstop and reinforcing steel of not less than 2 times the largest concrete aggregate size specified in Section 033000 "Cast-In-Place Concrete."

4. Secure waterstops in correct position at 12 inches on center.
 5. Field fabricate joints in accordance with manufacturer's instructions using heat welding.
 - a. Miter corners, intersections, and directional changes in waterstops.
 - b. Align center bulbs.
 6. Clean waterstops immediately prior to placement of concrete.
 7. Support and protect exposed waterstops during progress of the Work.
- B. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated on Drawings, according to manufacturer's written instructions, by adhesive bonding, mechanically fastening, and firmly pressing into place.
1. Install in longest lengths practicable.
 2. Locate waterstops in center of joint unless otherwise indicated on Drawings.
 3. Protect exposed waterstops during progress of the Work.

3.4 REMOVING AND REUSING FORMS

- A. Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations, and curing and protection operations need to be maintained.
1. Leave formwork for beam soffits, joists, slabs, and other structural elements that support weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
 2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- B. Clean and repair surfaces of forms to be reused in the Work.
1. Split, frayed, delaminated, or otherwise damaged form-facing material are unacceptable for exposed surfaces.
 2. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints.
1. Align and secure joints to avoid offsets.
 2. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.5 SHORING AND RESHORING INSTALLATION

- A. Comply with ACI 318 and ACI 301 for design, installation, and removal of shoring and reshoring.
1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.

- B. In multistory construction, extend shoring or reshoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement.
- C. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.6 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
- C. Inspections:
 - 1. Inspect formwork for shape, location, and dimensions of the concrete member being formed.
 - 2. Inspect insulating concrete forms for shape, location, and dimensions of the concrete member being formed.

END OF SECTION

SECTION 032000 - CONCRETE REINFORCING

1.1 SUMMARY

A. Section Includes:

1. Steel reinforcement bars.
2. Welded-wire reinforcement.

B. Related Requirements:

1. Section 321313 "Concrete Paving" for reinforcing related to concrete pavement and walks.
2. Section 321316 "Decorative Concrete Paving" for reinforcing related to decorative concrete pavement and walks.

1.2 ACTION SUBMITTALS

A. Product Data: For the following:

1. Each type of steel reinforcement.
2. Bar supports.

B. Shop Drawings: Comply with ACI SP-066:

1. Include placing drawings that detail fabrication, bending, and placement.
2. Include bar sizes, lengths, materials, grades, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, location of splices, lengths of lap splices, details of mechanical splice couplers, details of welding splices, tie spacing, hoop spacing, and supports for concrete reinforcement.
3. For structural thermal break insulated connection system, indicate general configuration, insulation dimensions, tension bars, compression pads, shear bars, and dimensions.

C. Construction Joint Layout: Indicate proposed construction joints required to build the structure.

1. Location of construction joints is subject to approval of Architect.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Statements: For testing and inspection agency.

1. Steel Reinforcement:
 - a. For reinforcement to be welded, mill test analysis for chemical composition and carbon equivalent of the steel in accordance with ASTM A706/A706M.

B. Field quality-control reports.

C. Minutes of preinstallation conference.

1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage
 - 1. Store reinforcement to avoid contact with earth.

2.1 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A615/A615M, Grade 60, deformed.
- B. Steel Bar Mats: ASTM A184/A184M, fabricated from ASTM A615/A615M, Grade 60, deformed bars, assembled with clips.
- C. Plain-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, plain, fabricated from as-drawn steel wire into flat sheets.
- D. Deformed-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, flat sheet.

2.2 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A615/A615M, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place.
 - 1. Manufacture bar supports from steel wire, plastic, or precast concrete in accordance with CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
 - a. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire, all-plastic bar supports, or CRSI Class 2 stainless steel bar supports.
 - b. For epoxy-coated reinforcement, use CRSI Class 1A epoxy-coated or other dielectric-polymer-coated wire bar supports.
 - c. For dual-coated reinforcement, use CRSI Class 1A epoxy-coated or other dielectric-polymer-coated wire bar supports.
 - d. For zinc-coated reinforcement, use galvanized wire or dielectric-polymer-coated wire bar supports.
 - e. For stainless steel reinforcement, use CRSI Class 1 plastic-protected steel wire, all-plastic bar supports, or CRSI Class 2 stainless steel bar supports.

- C. Steel Tie Wire: ASTM A1064/A1064M, annealed steel, not less than 0.0508 inch in diameter.
 - 1. Finish: Plain.

2.3 FABRICATING REINFORCEMENT

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

3.1 PREPARATION

- A. Protection of In-Place Conditions:

1. Do not cut or puncture vapor retarder.
 2. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.

3.2 INSTALLATION OF STEEL REINFORCEMENT

- A. Comply with CRSI's "Manual of Standard Practice" for placing and supporting reinforcement.
- B. Accurately position, support, and secure reinforcement against displacement.
1. Locate and support reinforcement with bar supports to maintain minimum concrete cover.
 2. Do not tack weld crossing reinforcing bars.
- C. Preserve clearance between bars of not less than 1 inch, not less than one bar diameter, or not less than 1-1/3 times size of large aggregate, whichever is greater.
- D. Provide concrete coverage in accordance with ACI 318.
- E. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- F. Splices: Lap splices as indicated on Drawings.
1. Bars indicated to be continuous, and all vertical bars to be lapped not less than 36 bar diameters at splices, or 24 inches, whichever is greater.
 2. Stagger splices in accordance with ACI 318.
- G. Install welded-wire reinforcement in longest practicable lengths.
1. Support welded-wire reinforcement in accordance with CRSI "Manual of Standard Practice."
 - a. For reinforcement less than W4.0 or D4.0, continuous support spacing to not exceed 12 inches.
 2. Lap edges and ends of adjoining sheets at least one wire spacing plus 2 inches for plain wire and 8 inches for deformed wire.
 3. Offset laps of adjoining sheet widths to prevent continuous laps in either direction.
 4. Lace overlaps with wire.

3.3 JOINTS

- A. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
1. Place joints perpendicular to main reinforcement.
 2. Continue reinforcement across construction joints unless otherwise indicated.
 3. Do not continue reinforcement through sides of strip placements of floors and slabs.

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

3.4 INSTALLATION TOLERANCES

- A. Comply with ACI 117.

3.5 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
- C. Inspections:
 - 1. Steel-reinforcement placement.
- D. Manufacturer's Inspections: Engage manufacturer of structural thermal break insulated connection system to inspect completed installations prior to placement of concrete, and to provide written report that installation complies with manufacturer's written instructions.

END OF SECTION

SECTION 033000 - CAST-IN-PLACE CONCRETE

1.1 SUMMARY

A. Section Includes:

1. Cast-in-place concrete, including concrete materials, mixture design, placement procedures, and finishes.

B. Related Requirements:

1. Section 031000 "Concrete Forming and Accessories" for form-facing materials, form liners, insulating concrete forms, and waterstops.
2. Section 032000 "Concrete Reinforcing" for steel reinforcing bars and welded-wire reinforcement.
3. Section 033543 "Polished Concrete Finishing" for concrete floors scheduled to receive a polished concrete finish.
4. Section 312000 "Earth Moving" for drainage fill under slabs-on-ground.
5. Section 321313 "Concrete Paving" for concrete pavement and walks.
6. Section 321316 "Decorative Concrete Paving" for decorative concrete pavement and walks.

1.2 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.
- B. Water/Cement Ratio (w/cm): The ratio by weight of water to cementitious materials.

1.3 ACTION SUBMITTALS

A. Product Data: For each of the following.

1. Portland cement.
2. Fly ash.
3. Slag cement.
4. Aggregates.
5. Admixtures:
 - a. Include limitations of use, including restrictions on cementitious materials, supplementary cementitious materials, air entrainment, aggregates, temperature at time of concrete placement, relative humidity at time of concrete placement, curing conditions, and use of other admixtures.
6. Vapor retarders.
7. Floor and slab treatments.

8. Liquid floor treatments.
 9. Curing materials.
 - a. Include documentation from color pigment manufacturer, indicating that proposed methods of curing are recommended by color pigment manufacturer.
 10. Joint fillers.
 11. Repair materials.
- B. Sustainable Design Submittals:
- C. Design Mixtures: For each concrete mixture, include the following:
1. Mixture identification.
 2. Minimum 28-day compressive strength.
 3. Durability exposure class.
 4. Maximum w/cm.
 5. Slump limit.
 6. Air content.
 7. Nominal maximum aggregate size.
 8. Indicate amounts of mixing water to be withheld for later addition at Project site if permitted.
 9. Include manufacturer's certification that permeability-reducing admixture is compatible with mix design.
 10. Include certification that dosage rate for permeability-reducing admixture matches dosage rate used in performance compliance test.
 11. Intended placement method.
 12. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
- D. Shop Drawings:
1. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
 - a. Location of construction joints is subject to approval of the Architect.
- E. Concrete Schedule: For each location of each Class of concrete indicated in "Concrete Mixtures" Article, including the following:
1. Concrete Class designation.
 2. Location within Project.
 3. Exposure Class designation.
 4. Formed Surface Finish designation and final finish.

5. Final finish for floors.
6. Curing process.
7. Floor treatment if any.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For the following:

1. Installer: Include copies of applicable ACI certificates.
2. Ready-mixed concrete manufacturer.
3. Testing agency: Include copies of applicable ACI certificates.

B. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.
2. Admixtures.
3. Curing compounds.
4. Floor and slab treatments.
5. Bonding agents.
6. Adhesives.
7. Vapor retarders.
8. Semirigid joint filler.
9. Joint-filler strips.
10. Repair materials.

C. Material Test Reports: For the following, from a qualified testing agency:

1. Portland cement.
2. Fly ash.
3. Slag cement.
4. Aggregates.
5. Admixtures:
 - a. Permeability-Reducing Admixture: Include independent test reports, indicating compliance with specified requirements, including dosage rate used in test.

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

E. Preconstruction Test Reports: For each mix design.

- F. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs Project personnel qualified as an ACI-certified Flatwork Technician and Finisher and a supervisor who is a certified ACI Flatwork Concrete Finisher/Technician or an ACI Concrete Flatwork Technician with experience installing and finishing concrete, incorporating permeability-reducing admixtures.
 - 1. Post-Installed Concrete Anchors Installers: ACI-certified Adhesive Anchor Installer.
- B. Ready-Mixed Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.
 - 1. Manufacturer certified in accordance with NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- C. Laboratory Testing Agency Qualifications: A testing agency qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated and employing an ACI-certified Concrete Quality Control Technical Manager.
 - 1. Personnel performing laboratory tests to be an ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Grade I. Testing agency laboratory supervisor to be an ACI-certified Concrete Laboratory Testing Technician, Grade II.
- D. Field Quality-Control Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.
 - 1. Personnel conducting field tests to be qualified as an ACI Concrete Field Testing Technician, Grade 1, in accordance with ACI CPP 610.1 or an equivalent certification program.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Comply with ASTM C94/C94M and ACI 301.

1.7 FIELD CONDITIONS

- A. Cold-Weather Placement: Comply with ACI 301 and ACI 306.1 and as follows.
 - 1. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 - 2. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
 - 3. Do not use frozen materials or materials containing ice or snow.
 - 4. Do not place concrete in contact with surfaces less than 35 deg F, other than reinforcing steel.
 - 5. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- B. Hot-Weather Placement: Comply with ACI 301 and ACI 305.1, and as follows:

1. Maintain concrete temperature at time of discharge to not exceed 95 deg F.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

1.8 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to furnish replacement sheet vapor retarder/termite barrier material and accessories for sheet vapor retarder/ termite barrier and accessories that do not comply with requirements or that fail to resist penetration by termites within specified warranty period.
 1. Warranty Period: 10 years from date of Substantial Completion.

2.1 CONCRETE, GENERAL

- A. ACI Publications: Comply with ACI 301 unless modified by requirements in the Contract Documents.

2.2 CONCRETE MATERIALS

A. Source Limitations:

1. Obtain all concrete mixtures from a single ready-mixed concrete manufacturer for entire Project.
2. Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant.
3. Obtain aggregate from single source.
4. Obtain each type of admixture from single source from single manufacturer.

B. Cementitious Materials:

1. Portland Cement: ASTM C150/C150M, Type I/II,.
2. Fly Ash: ASTM C618, Class C or F.
3. Slag Cement: ASTM C989/C989M, Grade 100 or 120.

C. Normal-Weight Aggregates: ASTM C33/C33M, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source.

1. Alkali-Silica Reaction: Comply with one of the following:
 - a. Expansion Result of Aggregate: Not more than 0.04 percent at one-year when tested in accordance with ASTM C1293.
 - b. Expansion Results of Aggregate and Cementitious Materials in Combination: Not more than 0.10 percent at an age of 16 days when tested in accordance with ASTM C1567.
 - c. Alkali Content in Concrete: Not more than 4 lb./cu. yd. for moderately reactive aggregate or 3 lb./cu. yd. for highly reactive aggregate, when tested in accordance with ASTM C1293 and categorized in accordance with ASTM C1778, based on alkali content being calculated in accordance with ACI 301.
2. Maximum Coarse-Aggregate Size: 3/4 inch nominal.
3. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

D. Air-Entraining Admixture: ASTM C260/C260M.

- E. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride in steel-reinforced concrete.
 - 1. Water-Reducing Admixture: ASTM C494/C494M, Type A.
 - 2. Retarding Admixture: ASTM C494/C494M, Type B.
 - 3. Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type D.
 - 4. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
 - 5. High-Range, Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type G.
 - 6. Plasticizing and Retarding Admixture: ASTM C1017/C1017M, Type II.
- F. Water and Water Used to Make Ice: ASTM C94/C94M, potable

2.3 VAPOR RETARDERS

- A. Sheet Vapor Retarder, Class A: ASTM E1745, Class A, except with maximum water-vapor permeance of; not less than 15 mils thick. Include manufacturer's recommended adhesive or pressure-sensitive tape.

2.4 LIQUID FLOOR TREATMENTS

- A. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or silicate materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces.

2.5 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 C171, polyethylene film burlap-polyethylene sheet.
 - 1. Color:
 - a. Ambient Temperature Below 50 deg F: Black.
 - b. Ambient Temperature between 50 deg F and 85 deg F: Any color.
 - c. Ambient Temperature Above 85 deg F: White.

- D. Curing Paper: 8-foot-wide paper, consisting of two layers of fibered kraft paper laminated with double coating of asphalt.

- E. Water: Potable or complying with ASTM C1602/C1602M.

- F. Clear, Waterborne, Membrane-Forming, Dissipating Curing Compound: ASTM C309, Type 1, Class B.

2.6 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D1751, asphalt-saturated cellulosic fiber.

- B. Bonding Agent: ASTM C1059/C1059M, Type II, nonredispersible, acrylic emulsion or styrene butadiene.

- C. Epoxy Bonding Adhesive: ASTM C881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade and class to suit requirements, and as follows:
 - 1. Types I and II, nonload bearing, or Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

2.7 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
 - 1. Cement Binder: ASTM C150/C150M portland cement or hydraulic or blended hydraulic cement, as defined in ASTM C219.
 - 2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
 - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand, as recommended by underlayment manufacturer.
 - 4. Compressive Strength: Not less than 4100 psi at 28 days when tested in accordance with ASTM C109/C109M.
- B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.
 - 1. Cement Binder: ASTM C150/C150M portland cement or hydraulic or blended hydraulic cement, as defined in ASTM C219.
 - 2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
 - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
 - 4. Compressive Strength: Not less than 5000 psi at 28 days when tested in accordance with ASTM C109/C109M.

2.8 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, in accordance with ACI 301.
 - 1. Use a qualified testing agency for preparing and reporting proposed mixture designs, based on laboratory trial mixtures.
- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
 - 1. Fly Ash or Other Pozzolans: 25 percent by mass.
 - 2. Slag Cement: 50 percent by mass.
 - 3. Silica Fume: 10 percent by mass.

4. Total of Fly Ash or Other Pozzolans, Slag Cement, and Silica Fume: 50 percent by mass, with fly ash or pozzolans not exceeding 25 percent by mass and silica fume not exceeding 10 percent by mass.
5. Total of Fly Ash or Other Pozzolans and Silica Fume: 35 percent by mass with fly ash or pozzolans not exceeding 25 percent by mass and silica fume not exceeding 10 percent by mass.

C. Admixtures: Use admixtures in accordance with manufacturer's written instructions.

2.9 CONCRETE MIXTURES

A. Class A: Normal-weight concrete used for footings and foundation walls.

1. Exposure Class: ACI 318 F1 S0 W0 C1.
2. Minimum Compressive Strength: 4000 psi at 28 days.
3. Maximum w/cm: 0.50.
4. Slump Limit: 4 inches, plus or minus 1 inch.
5. Air Content:
 - a. Exposure Class F1: 5.0 percent, plus or minus 1.5 percent at point of delivery for concrete containing 3/4-inch nominal maximum aggregate size.
6. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

B. Class B: Normal-weight concrete used for interior slabs-on-ground.

1. Exposure Class: ACI 318 F0 S0 W0 C0.
2. Minimum Compressive Strength: 4000 psi at 28 days.
3. Maximum w/cm: 0.50.
4. Slump Limit: 4 inches, plus or minus 1 inch.
5. Minimum Cementitious Materials Content: 540 lb/cu. yd.
6. Air Content:
 - a. Do not use an air-entraining admixture or allow total air content to exceed 3 percent for concrete used in trowel-finished floors.
7. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

C. Class C: Normal-weight concrete used for exterior retaining walls.

1. Exposure Class: ACI 318 F3 S0 W0 C2.
2. Minimum Compressive Strength: 5000 psi at 28 days.
3. Maximum w/cm: 0.40.
4. Slump Limit: 4 inches, plus or minus 1 inch.

5. Air Content:
 - a. Exposure Classes F2 and F3: 6 percent, plus or minus 1.5 percent at point of delivery for concrete containing 3/4-inch nominal maximum aggregate size.
6. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

2.10 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete in accordance with ASTM C94/C94M, and furnish batch ticket information.
- B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete in accordance with ASTM C94/C94M. Mix concrete materials in appropriate drum-type batch machine mixer.
 1. For mixer capacity of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than five minutes after ingredients are in mixer, before any part of batch is released.
 2. For mixer capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd..
 3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

3.1 EXAMINATION

- A. Verification of Conditions:
 1. Before placing concrete, verify that installation of concrete forms, accessories, and reinforcement, and embedded items is complete and that required inspections have been performed.
 2. Do not proceed until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Provide reasonable auxiliary services to accommodate field testing and inspections, acceptable to testing agency, including the following:
 1. Daily access to the Work.
 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 3. Secure space for storage, initial curing, and field curing of test samples, including source of water and continuous electrical power at Project site during site curing period for test samples.
 4. Security and protection for test samples and for testing and inspection equipment at Project site.

3.3 INSTALLATION OF EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining Work that is attached to or supported by cast-in-place concrete.
 1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of ANSI/AISC 303.
3. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.

3.4 INSTALLATION OF VAPOR RETARDER

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder in accordance with ASTM E1643 and manufacturer's written instructions.
 1. Install vapor retarder with longest dimension parallel with direction of concrete pour.
 2. Face laps away from exposed direction of concrete pour.
 3. Lap vapor retarder over footings and grade beams not less than 6 inches, sealing vapor retarder to concrete.
 4. Lap joints 6 inches and seal with manufacturer's recommended tape.
 5. Terminate vapor retarder at the top of floor slabs, grade beams, and pile caps, sealing entire perimeter to floor slabs, grade beams, foundation walls, or pile caps.
 6. Seal penetrations in accordance with vapor retarder manufacturer's instructions.
 7. Protect vapor retarder during placement of reinforcement and concrete.
 - a. Repair damaged areas by patching with vapor retarder material, overlapping damages area by 6 inches on all sides, and sealing to vapor retarder.
- B. Bituminous Vapor Retarders: Place, protect, and repair bituminous vapor retarder in accordance with manufacturer's written instructions.

3.5 JOINTS

- A. Construct joints true to line, with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Coordinate with floor slab pattern and concrete placement sequence.
 1. Install so strength and appearance of concrete are not impaired, at locations indicated on Drawings or as approved by Architect.
 2. Place joints perpendicular to main reinforcement.
 - a. Continue reinforcement across construction joints unless otherwise indicated.
 - b. Do not continue reinforcement through sides of strip placements of floors and slabs.
 3. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 4. Space vertical joints in walls as indicated on Drawings. Unless otherwise indicated on Drawings, locate vertical joints beside piers integral with walls, near corners, and in concealed locations where possible.
 5. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

6. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Control Joints in Slabs-on-Ground: Form weakened-plane control joints, sectioning concrete into areas as indicated. Construct control joints for a depth equal to at least one-fourth of concrete thickness as follows:
1. Grooved Joints: Form control joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of control joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
 2. Sawed Joints: Form control joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random cracks.
- D. Isolation Joints in Slabs-on-Ground: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated on Drawings.
 2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface, where joint sealants, specified in Section 079200 "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.
- E. Doweled Joints:
1. Install dowel bars and support assemblies at joints where indicated on Drawings.
 2. Lubricate or asphalt coat one-half of dowel bar length to prevent concrete bonding to one side of joint.
- F. Dowel Plates: Install dowel plates at joints where indicated on Drawings.

3.6 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, embedded items, and vapor retarder is complete and that required inspections are completed.
1. Immediately prior to concrete placement, inspect vapor retarder for damage and deficient installation, and repair defective areas.
 2. Provide continuous inspection of vapor retarder during concrete placement and make necessary repairs to damaged areas as Work progresses.
- B. Notify Architect and testing and inspection agencies 24 hours prior to commencement of concrete placement.
- C. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect in writing, but not to exceed the amount indicated on the concrete delivery ticket.
1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

- D. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301, but not to exceed the amount indicated on the concrete delivery ticket.
 - 1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- E. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness.
 - 1. If a section cannot be placed continuously, provide construction joints as indicated.
 - 2. Deposit concrete to avoid segregation.
 - 3. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
 - 4. Consolidate placed concrete with mechanical vibrating equipment in accordance with ACI 301.
 - a. Do not use vibrators to transport concrete inside forms.
 - b. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer.
 - c. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity.
 - d. At each insertion, limit duration of vibration to time necessary to consolidate concrete, and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- F. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
 - 1. Do not place concrete floors and slabs in a checkerboard sequence.
 - 2. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 - 3. Maintain reinforcement in position on chairs during concrete placement.
 - 4. Screed slab surfaces with a straightedge and strike off to correct elevations.
 - 5. Level concrete, cut high areas, and fill low areas.
 - 6. Slope surfaces uniformly to drains where required.
 - 7. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface.
 - 8. Do not further disturb slab surfaces before starting finishing operations.

3.7 FINISHING FORMED SURFACES

- A. As-Cast Surface Finishes:
 - 1. ACI 301 Surface Finish SF-1.0: As-cast concrete texture imparted by form-facing material.
 - a. Patch voids larger than 1-1/2 inches wide or 1/2 inch deep.
 - b. Remove projections larger than 1 inch.
 - c. Tie holes do not require patching.
 - d. Surface Tolerance: ACI 117 Class D.
 - e. Apply to concrete surfaces not exposed to public view.

B. Related Unformed Surfaces:

1. At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a color and texture matching adjacent formed surfaces.
2. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.8 FINISHING FLOORS AND SLABS

A. Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Scratch Finish:

1. While still plastic, texture concrete surface that has been screeded and bull-floated or darbied.
2. Use stiff brushes, brooms, or rakes to produce a profile depth of 1/4 inch in one direction.
3. Apply scratch finish to surfaces to receive concrete floor toppings or to receive mortar setting beds for bonded cementitious floor finishes.

C. Float Finish:

1. When bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operation of specific float apparatus, consolidate concrete surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats.
2. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture and complies with ACI 117 tolerances for conventional concrete.
3. Apply float finish to surfaces to receive trowel finish.

D. Trowel Finish:

1. After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel.
2. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance.
3. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
4. Do not add water to concrete surface.
5. Do not apply hard-troweled finish to concrete, which has a total air content greater than 3 percent.
6. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
7. Finish surfaces to the following tolerances, in accordance with ASTM E1155, for a randomly trafficked floor surface:
 - a. Slabs on Ground:

- 1) Specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24, and of levelness, F(L) 18

- E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thinset method. While concrete is still plastic, slightly scarify surface with a fine broom perpendicular to main traffic route.
 1. Coordinate required final finish with Architect before application.
 2. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.
- F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and locations indicated on Drawings.
 1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route.
 2. Coordinate required final finish with Architect before application.

3.9 INSTALLATION OF MISCELLANEOUS CONCRETE ITEMS

- A. Filling In:
 1. Fill in holes and openings left in concrete structures after Work of other trades is in place unless otherwise indicated.
 2. Mix, place, and cure concrete, as specified, to blend with in-place construction.
 3. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations:
 1. Coordinate sizes and locations of concrete bases with actual equipment provided.
 2. Construct concrete bases 6 inches high unless otherwise indicated on Drawings, and extend base not less than 6 inches in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated on Drawings, or unless required for seismic anchor support.
 3. Minimum Compressive Strength: 4000 psi at 28 days.
 4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
 5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete substrate.
 6. Prior to pouring concrete, place and secure anchorage devices.
 - a. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - b. Cast anchor-bolt insert into bases.

- c. Install anchor bolts to elevations required for proper attachment to supported equipment.

3.10 CONCRETE CURING

- A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
 1. Comply with ACI 301 and ACI 306.1 for cold weather protection during curing.
 2. Comply with ACI 301 and ACI 305.1 for hot-weather protection during curing.
 3. Maintain moisture loss no more than 0.2 lb/sq. ft. x h, calculated in accordance with ACI 305.1, before and during finishing operations.

- B. Curing Formed Surfaces: Comply with ACI 308.1 as follows:
 1. Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces.
 2. Cure concrete containing color pigments in accordance with color pigment manufacturer's instructions.
 3. If forms remain during curing period, moist cure after loosening forms.
 4. If removing forms before end of curing period, continue curing for remainder of curing period, as follows:
 - a. Continuous Fogging: Maintain standing water on concrete surface until final setting of concrete.
 - b. Continuous Sprinkling: Maintain concrete surface continuously wet.
 - c. Absorptive Cover: Pre-dampen absorptive material before application; apply additional water to absorptive material to maintain concrete surface continuously wet.
 - d. Water-Retention Sheetting Materials: Cover exposed concrete surfaces with sheetting material, taping, or lapping seams.
 - e. Membrane-Forming Curing Compound: Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.
 - 1) Recoat areas subject to heavy rainfall within three hours after initial application.
 - 2) Maintain continuity of coating and repair damage during curing period.

- C. Curing Unformed Surfaces: Comply with ACI 308.1 as follows:
 1. Begin curing immediately after finishing concrete.
 2. Interior Concrete Floors:
 - a. Floors to Receive Floor Coverings Specified in Other Sections: Contractor has option of the following:
 - 1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
 - a) Lap edges and ends of absorptive cover not less than 12 inches.
 - b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.
 - 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.
 - a) Immediately repair any holes or tears during curing period, using cover material and waterproof tape.

- b) Cure for not less than seven days.
 - 3) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:
 - a) Water.
 - b) Continuous water-fog spray.
- b. Floors to Receive Penetrating Liquid Floor Treatments: Contractor has option of the following:
 - 1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
 - a) Lap edges and ends of absorptive cover not less than 12 inches.
 - b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.
 - 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.
 - a) Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
 - b) Cure for not less than seven days.
 - 3) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:
 - a) Water.
 - b) Continuous water-fog spray.
- c. Floors to Receive Polished Finish: Contractor has option of the following:
 - 1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
 - a) Lap edges and ends of absorptive cover not less than 12 inches.
 - b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.
 - 2) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:
 - a) Water.
 - b) Continuous water-fog spray.
- d. Floors to Receive Chemical Stain:
 - 1) As soon as concrete has sufficient set to permit application without marring concrete surface, install curing paper over entire area of floor.
 - 2) Install curing paper square to building lines, without wrinkles, and in a single length without end joints.
 - 3) Butt sides of curing paper tight; do not overlap sides of curing paper.
 - 4) Leave curing paper in place for duration of curing period, but not less than 28 days.
- e. Floors to Receive Urethane Flooring:
 - 1) As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
 - 2) Rewet absorptive cover, and cover immediately with polyethylene moisture-retaining cover with edges lapped 6 inches and sealed in place.
 - 3) Secure polyethylene moisture-retaining cover in place to prohibit air from circulating under polyethylene moisture-retaining cover.
 - 4) Leave absorptive cover and polyethylene moisture-retaining cover in place for duration of curing period, but not less than 28 days.
- f. Floors to Receive Curing Compound:

- 1) Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.
 - 2) Recoat areas subjected to heavy rainfall within three hours after initial application.
 - 3) Maintain continuity of coating, and repair damage during curing period.
 - 4) Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound does not interfere with bonding of floor covering used on Project.
- g. Floors to Receive Curing and Sealing Compound:
- 1) Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller in accordance with manufacturer's written instructions.
 - 2) Recoat areas subjected to heavy rainfall within three hours after initial application.
 - 3) Repeat process 24 hours later, and apply a second coat. Maintain continuity of coating, and repair damage during curing period.

3.11 TOLERANCES

- A. Conform to ACI 117.

3.12 APPLICATION OF LIQUID FLOOR TREATMENTS

- A. Penetrating Liquid Floor Treatment for Polished Concrete Finish:

1. Comply with Section 033543 "Polished Concrete Finishing"

3.13 JOINT FILLING

- A. Prepare, clean, and install joint filler in accordance with manufacturer's written instructions.

1. Defer joint filling until concrete has aged at least one month.
2. Do not fill joints until construction traffic has permanently ceased.

- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.

- C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints.

- D. Overfill joint, and trim joint filler flush with top of joint after hardening.

3.14 CONCRETE SURFACE REPAIRS

- A. Defective Concrete:

1. Repair and patch defective areas when approved by Architect.
2. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

- B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete.
 - a. Limit cut depth to 3/4 inch.
 - b. Make edges of cuts perpendicular to concrete surface.
 - c. Clean, dampen with water, and brush-coat holes and voids with bonding agent.
 - d. Fill and compact with patching mortar before bonding agent has dried.
 - e. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement, so that, when dry, patching mortar matches surrounding color.
 - a. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching.
 - b. Compact mortar in place and strike off slightly higher than surrounding surface.
3. Repair defects on concealed formed surfaces that will affect concrete's durability and structural performance as determined by Architect.

D. Repairing Unformed Surfaces:

1. Test unformed surfaces, such as floors and slabs, for finish, and verify surface tolerances specified for each surface.
 - a. Correct low and high areas.
 - b. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
2. Repair finished surfaces containing surface defects, including spalls, popouts, honeycombs, rock pockets, crazing, and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
3. After concrete has cured at least 14 days, correct high areas by grinding.
4. Correct localized low areas during, or immediately after, completing surface-finishing operations by cutting out low areas and replacing with patching mortar.
 - a. Finish repaired areas to blend into adjacent concrete.
5. Correct other low areas scheduled to receive floor coverings with a repair underlayment.
 - a. Prepare, mix, and apply repair underlayment and primer in accordance with manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 - b. Feather edges to match adjacent floor elevations.
6. Correct other low areas scheduled to remain exposed with repair topping.
 - a. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations.
 - b. Prepare, mix, and apply repair topping and primer in accordance with manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
7. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete.
 - a. Remove defective areas with clean, square cuts, and expose steel reinforcement with at least a 3/4-inch clearance all around.
 - b. Dampen concrete surfaces in contact with patching concrete and apply bonding agent.
 - c. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate.

- d. Place, compact, and finish to blend with adjacent finished concrete.
 - e. Cure in same manner as adjacent concrete.
8. Repair random cracks and single holes 1 inch or less in diameter with patching mortar.
- a. Groove top of cracks and cut out holes to sound concrete, and clean off dust, dirt, and loose particles.
 - b. Dampen cleaned concrete surfaces and apply bonding agent.
 - c. Place patching mortar before bonding agent has dried.
 - d. Compact patching mortar and finish to match adjacent concrete.
 - e. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.15 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a special inspector to perform field tests and inspections and prepare testing and inspection reports.
- B. Testing Agency: Owner will engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
1. Testing agency to be responsible for providing curing container for composite samples on Site and verifying that field-cured composite samples are cured in accordance with ASTM C31/C31M.
 2. Testing agency to immediately report to Architect, Contractor, and concrete manufacturer any failure of Work to comply with Contract Documents.
 3. Testing agency to report results of tests and inspections, in writing, to Owner, Architect, Contractor, and concrete manufacturer within 48 hours of inspections and tests.
 - a. Test reports to include reporting requirements of ASTM C31/C31M, ASTM C39/C39M, and ACI 301, including the following as applicable to each test and inspection:
 - 1) Project name.
 - 2) Name of testing agency.
 - 3) Names and certification numbers of field and laboratory technicians performing inspections and testing.
 - 4) Name of concrete manufacturer.
 - 5) Date and time of inspection, sampling, and field testing.
 - 6) Date and time of concrete placement.
 - 7) Location in Work of concrete represented by samples.
 - 8) Date and time sample was obtained.
 - 9) Truck and batch ticket numbers.
 - 10) Design compressive strength at 28 days.
 - 11) Concrete mixture designation, proportions, and materials.
 - 12) Field test results.
 - 13) Information on storage and curing of samples before testing, including curing method and maximum and minimum temperatures during initial curing period.
 - 14) Type of fracture and compressive break strengths at seven days and 28 days.
- C. Batch Tickets: For each load delivered, submit three copies of batch delivery ticket to testing agency, indicating quantity, mix identification, admixtures, design strength, aggregate size, design air content, design slump at time of batching, and amount of water that can be added at Project site.
- D. Inspections:

1. Headed bolts and studs.
 2. Verification of use of required design mixture.
 3. Concrete placement, including conveying and depositing.
 4. Curing procedures and maintenance of curing temperature.
 5. Verification of concrete strength before removal of shores and forms from beams and slabs.
 6. Batch Plant Inspections: On a random basis, as determined by Architect.
- E. Concrete Tests: Testing of composite samples of fresh concrete obtained in accordance with ASTM C 172/C 172M to be performed in accordance with the following requirements:
1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
 - a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing to be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 2. Slump: ASTM C143/C143M:
 - a. One test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 - b. Perform additional tests when concrete consistency appears to change.
 3. Slump Flow: ASTM C1611/C1611M:
 - a. One test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 - b. Perform additional tests when concrete consistency appears to change.
 4. Air Content: ASTM C231/C231M pressure method, for normal-weight concrete;
 - a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 5. Concrete Temperature: ASTM C1064/C1064M:
 - a. One test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for each composite sample.
 6. Unit Weight: ASTM C567/C567M fresh unit weight of structural lightweight concrete.
 - a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 7. Compression Test Specimens: ASTM C31/C31M:
 - a. Cast and laboratory cure two sets of three 6-inch by 12-inch or 4-inch by 8-inch cylinder specimens for each composite sample.
 8. Compressive-Strength Tests: ASTM C39/C39M.
 - a. Test one set of three laboratory-cured specimens at seven days and one set of two specimens at 28 days.
 - b. Test one set of three field-cured specimens at seven days and one set of two specimens at 28 days.
 - c. A compressive-strength test to be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

9. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor to evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
 10. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength, and no compressive-strength test value falls below specified compressive strength by more than 500 psi if specified compressive strength is 5000 psi, or no compressive strength test value is less than 10 percent of specified compressive strength if specified compressive strength is greater than 5000 psi.
 11. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
 12. Additional Tests:
 - a. Testing and inspecting agency to make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.
 - b. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42/C42M or by other methods as directed by Architect.
 - 1) Acceptance criteria for concrete strength to be in accordance with ACI 301, Section 1.6.6.3.
 13. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
 14. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.
- F. Measure floor and slab flatness and levelness in accordance with ASTM E1155 within 24 hours of completion of floor finishing and promptly report test results to Architect.

3.16 PROTECTION

- A. Protect concrete surfaces as follows:
1. Protect from petroleum stains.
 2. Diaper hydraulic equipment used over concrete surfaces.
 3. Prohibit vehicles from interior concrete slabs.
 4. Prohibit use of pipe-cutting machinery over concrete surfaces.
 5. Prohibit placement of steel items on concrete surfaces.
 6. Prohibit use of acids or acidic detergents over concrete surfaces.
 7. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.
 8. Protect concrete surfaces scheduled to receive surface hardener or polished concrete finish using Floor Slab Protective Covering.

END OF SECTION

SECTION 033543 - POLISHED CONCRETE FINISHING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Polished concrete finishing for exposed concrete floor slabs designated CONC-1.
 - 1. Concrete for polished concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, initial finishing, and curing is specified in Section 033000 "Cast-in-Place Concrete."
- B. Related Requirements:
 - 1. Section 033000 "Cast-in-Place Concrete" for concrete not designated as polished concrete.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with polished concrete to attend, including the following:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixtures.
 - c. Ready-mix concrete manufacturer.
 - d. Cast-in-place concrete subcontractor.
 - e. Polished concrete finishing Subcontractor.
 - 2. Review cold- and hot-weather concreting procedures, curing procedures, construction joints, concrete repair procedures, concrete finishing, and protection of polished concrete including the following:
 - a. Environmental requirements.
 - b. Scheduling and phasing of work.
 - c. Protection of adjacent surfaces.
 - d. Surface preparation.
 - e. Repairing defects and defective work before application of polishing treatments.
 - f. Installation of polished floor finishes.
 - g. Application of penetrating liquid floor treatments.
 - h. Floor flatness and levelness measurements.
 - i. Protection of finished surfaces after installation.

1.3 ACTION SUBMITTALS

- A. Sustainable Design Submittals: Provide Sustainable Design Submittals in Accordance with Section 018113.
 - 1. Building Product Disclosure Requirements: To encourage the use of building products that are working to minimize their environmental and health impacts, provide the following information when available:

- a. Environmental Product Declaration: Submit with Product-specific Type III or Industry-wide Type III Environmental Product Declaration (EPD).
 - 2. Material Ingredient Reporting: Submit Cradle to Cradle (C2C) certification (v2 Basic or v3 Bronze level), Health Product Declaration (HPD), or Declare product labels.
 - 3. General Emissions Evaluation: Paints and Coatings must be tested and determined compliant in accordance with California Department of Public Health (CDPH) Standard Method v1.2-2017, using the applicable exposure scenario. Show compliance with VOC limits as detailed in Section 01 8113 "VOC Limits". VOC Content Requirement for Wet Applied Products: All paints and coatings wet-applied on site must meet the applicable VOC limits of the California Air Resources Board (CARB) 2007, Suggested Control Measures (SCM) for Architectural Coatings, or the South Coast Air Quality Management District (SCAQMD) Rule 1113, effective February 5, 2016.
 - B. Product Data: For each type of product.
 - C. Polishing Schedule: Submit plan showing polished concrete surfaces and schedule of polishing operations for each area of polished concrete before start of polishing operations. Include locations of all joints, including construction joints.
- 1.4 INFORMATIONAL SUBMITTALS
 - A. Qualification Data: For Installer.
 - B. Material Certificates: For each of the following, signed by manufacturers:
 - 1. Repair materials.
 - 2. Liquid floor treatments.
 - C. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.
- 1.5 QUALITY ASSURANCE
 - A. Installer Qualifications: An experienced applicator who has specialized in floor treatments similar in material, design, and extent to that indicated for this Project and who is approved by manufacturer for application of floor polishing system required for this Project.
 - 1. Installers shall be trained and hold current certification for installation of specified concrete polishing system.
 - B. Field Sample Panels: Before polishing concrete, produce field sample panels to show the range of selections available for polishing treatments. Produce a minimum of (3) three sets of full-scale panels, approximately 48 by 48 inches (1200 by 1200 mm) minimum, to demonstrate the available range of finish, color, and appearance variations, including various aggregate exposure and sheen. Architect will select one or more examples from field samples for finishes to be produced in mockups.
 - 1. Locate panels as indicated or, if not indicated, as directed by Architect.
 - 2. Demonstrate methods of polishing, coloring if applicable, penetrating liquid floor treatments, and sealing coats.
 - 3. If Architect determines that field sample panels do not demonstrate acceptable examples of polishing treatments, prepare additional sample panels until approved.
 - 4. Maintain field sample panels during construction in an undisturbed condition as a standard for judging the completed Work.
 - 5. Demolish and remove field sample panels when directed.

- C. Mockups: After approval of verification sample and before casting or polishing concrete, build mockups to verify selections made under Sample submittals and to demonstrate typical joints, surface finish, tolerances, and standard of workmanship. Build mockups to comply with the following requirements, using materials indicated for the completed Work:
1. Prepare mockups for polished finish for interior concrete floor slabs, not less than 100 sq. ft. (10 sq. m) in size and at location as directed by Architect, to demonstrate the expected range of finish, color, and texture variations.
 2. Demonstrate methods of polishing, coloring if applicable, penetrating liquid floor treatments, and sealing coats.
 3. Demonstrate 3 separate mockup area options for Aggregate Exposure Classes. Options should range from Class B to Class C.
 4. If Architect determines that mockups do not comply with requirements, prepare additional mockups until approved.
 5. Demonstrate curing, finishing, and protecting of polished concrete.
 6. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

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

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ventilation, ambient temperature and humidity, and other conditions affecting performance of floor polishing system.
- B. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.
- C. Protection of Concrete Slabs: Provide and maintain protection for concrete slabs indicated to receive polished finishes, before, during and following finish application, to prevent stains from petroleum, rust and other detrimental effects.
1. Avoid use of hydraulic powered equipment on slabs. Where this cannot be avoided, diaper the equipment to prevent staining the concrete.
 2. Avoid movement and parking of vehicles on concrete slabs. Where this cannot be avoided, provide protection over slabs to prevent contamination and staining.
 3. Do not use or locate pipe cutting equipment on exposed slabs.
 4. Do not place steel on exposed slabs.
 5. Do not use or transfer acids, acidic detergents, or petroleum products on slabs.
- D. Work Sequencing: Comply with manufacturer's written recommendations for sequencing floor polishing work with construction operations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Static Coefficient of Friction of Polished Concrete: Provide polished concrete surfaces with the following values for slip resistance as determined by testing identical products per ASTM C 1028:

1. Level Surfaces: Minimum 0.6.

2.2 MANUFACTURERS

- A. Source Limitations: Obtain each type of material and finishing equipment from one manufacturer with resources to provide products that will produce consistent quality in appearance and physical properties.

2.3 CONCRETE FLOOR FINISHING TREATMENTS

- A. Polished Concrete Finish Systems: Manufacturer's proprietary system of grinding and polishing treatments to produce polished concrete surfaces of the type indicated.
 1. Basis-of-Design Product: Subject to compliance with requirements, provide Advanced Floor Products; Retro-Plate 99, or comparable products and systems by the following:
 - a. W. R. Meadows, Inc; Induroshine.

2.4 LIQUID FLOOR TREATMENTS

- A. Penetrating Liquid Floor Treatments for Polished Concrete Finish: Clear, waterborne solution of inorganic silicate or silicate materials and proprietary components; odorless; that penetrates, hardens, and is suitable for polished concrete surfaces.
 1. Basis-of-Design Product: Subject to compliance with requirements, provide Advanced Floor Products; Retro-Plate 99, or the following:
 - a. W. R. Meadows, Inc; Liqui-Hard Ultra VOC.
- B. Auxiliary Materials, General: Provide accessories and related materials as recommended by concrete finishing system manufacturer.
- C. Protective Cover: Use covering products recommended by concrete finishing system manufacturer, to protect concrete floors after completing specified treatments and final cleaning.
- D. Concrete Finish Enhancer: Stain repellent topically-applied protective coating, compatible with chemically hardened floors; VOC content complying with limits of authorities having jurisdiction.
 1. Basis-of-Design Product: Subject to compliance with requirements, provide Advanced Floor Products; Retro-Plate RetroGuard™, or comparable product by the following:
 - a. W. R. Meadows, Inc; Bellatrix.

2.5 AUXILIARY MATERIALS

- A. Control Joint Filler: Semi-rigid, two-component, self-leveling, 100 percent solids, rapid-curing, polyurea control joint and crack filler with Shore A hardness not less than 80.
 1. Basis-of-Design Product: Euclid; Euco Quickjoint ~~UVR 200~~.
 2. Color: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Applicator present, for compliance with requirements for installation tolerances and other conditions affecting performance.
 - 1. Verify that concrete has been in place not less than 45 days or as recommended by concrete finishing system manufacturers.
 - 2. 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.

3.3 CONCRETE FLOOR FINISHING TREATMENT APPLICATION, GENERAL

- A. Mix and apply products and components according to manufacturer's written instructions.
- B. Close areas to traffic during polishing treatment application and for time period after application recommended in writing by manufacturer.
- C. Produce uniform, sharply defined finish edges of floor finish adjoining other materials.
- D. Cure floor treatments according to manufacturer's written instructions. Prevent contamination during application and curing processes.

3.4 POLISHING

- A. Aggregate Exposure: Range of Class B and Class C. To match approved mockup.
- B. Gloss: Level 3: Polished, 800 grit; unless otherwise required to match approved mockup.
- C. Apply polished concrete finish system to cured and prepared slabs to match accepted mockup.
 - 1. Machine grind floor surfaces to receive polished finishes level and smooth and to depth required to reveal aggregate to match approved mockup.
 - 2. Apply penetrating liquid floor treatment for polished concrete in polishing sequence and according to manufacturer's written instructions, allowing recommended drying time between successive coats.
 - 3. Continue polishing with progressively finer-grit diamond polishing pads to gloss level, to match approved mockup.
 - 4. Control and dispose of waste products produced by grinding and polishing operations.
 - 5. Neutralize and clean polished floor surfaces.
- D. Surface Tolerances: Produced finished surfaces to comply with the following tolerances, according to ASTM E 1155 (ASTM E 1155M), for a randomly trafficked floor surface:
 - 1. Specified overall values of flatness, F(F) 40; and of levelness, F(L) 30; with minimum local values of flatness, F(F) 25; and of levelness, F(L) 20.

- E. Concrete Finish Enhancer: Uniformly apply two continuous coats of concrete finish enhancer to hardened concrete by power spray according to manufacturer's written instructions to produce sheen matching approved mockups.

- 1. Burnish polished concrete surfaces within 2 hours after application of concrete finish enhancer.

3.5 ADJUSTING AND CLEANING

- A. Remove defects and repolish defective areas.
- B. Perform final cleaning according to manufacturer's instructions. Mechanically scrub treated floors for period and using methods recommended by floor polishing system manufacturer.

3.6 PROTECTION

- A. Protect floor slabs from mars, marks, stains, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
 - 1. Use protective covering recommended by concrete finishing system manufacturer.

END OF SECTION

SECTION 040101 – REPAIR AND CLEANING OF EXISTING MASONRY

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

- A. Applicable provisions of Bidding Requirements, Contract Requirements in Division 0 and all applicable Division 01 sections.
- B. Work of this section shall be governed by the Contract Documents. Provide materials, labor, equipment, and services necessary to furnish, deliver, and install all work of this section as shown on the drawings, as specified herein, and/or as required by job conditions.

1.2 SUMMARY

A. Section Includes:

- 1. Cleaning, repointing and repair of existing masonry.
 - a. Stain and dirt removal by chemicals from historic surfaces including limestone, unpolished granite, and concrete. Mock-ups will determine the most appropriate method.
 - b. Visual Requirements to maintain aesthetic or historic qualities of Project by protecting Work designated to remain.
 - c. Including paint removal on exterior stone and limestone masonry as indicated on drawings.
 - d. Cleaning, repointing and repair of exterior stone and limestone masonry, granite steps and base and other stone masonry as indicated on the Drawings.
 - e. Replacement of stone masonry as indicated on drawings.
 - f. Repointing for mortar joints in stone and limestone masonry as indicated on drawings.
 - g. Water cleaning of existing interior and exterior masonry surfaces as indicated on drawings.
- 2. Related Section:
 - a. Section 042000 Unit Masonry - for items not defined in this section.
 - b. Section 079200 Joints Sealants - for items not defined in this section.
- 3. Scope of Cleaning Work: The scope cleaning of existing exterior masonry indicated on drawings.
 - a. General cleaning for 100 percent cleaning of existing exterior masonry indicated on drawings.
 - b. Paint removal as generally indicated on drawings with an allowance for 5% more than drawings show.
 - c. Patching of masonry walls wherever small holes are encountered and as result of cleaning.
 - d. Cleaning of exterior limestone masonry, as designated on the Drawings, using the
 - e. "water-misting" method.
 - f. Cleaning of exterior limestone masonry walls, as designated on the Drawings, using a low pressure water wash.
 - g. Cleaning of selected areas of limestone as designated on the Drawings, using a restoration

- cleaner or poultice.
 - h. Cleaning of the granite building base and steps as designated on the Drawings, using a restoration cleaner.
 - i. Cleaning of adhesive residue from the granite building base as designated on the Drawings, using a restoration cleaner.
 - j. Cleaning of ferrous stains on the granite building base and steps as designated on the Drawings, using a restoration cleaner.
4. Scope of Removal includes removing the following from existing masonry as indicated on drawings:
- a. Dirt and soil.
 - b. Tar, asphalt, and bitumens.
 - c. Paint and coatings.
 - d. Graffiti and graffiti resistant coatings.
 - e. Rust and metallic stains.
 - f. Efflorescence and lime.
 - g. Carbon encrustation and soot.
 - h. Body oils, finger prints, hand prints, foot prints.
 - i. All other non-masonry substances, stains, and contamination.
5. Scope of masonry joint repointing and sealant replacement as follows:
- a. Replacement of stone masonry units as indicated on drawings.
 - b. Repointing for mortar joints in stone masonry.
 - c. Repointing as scoped on drawings; the following is applicable if less than 100% repointing is required.
 - i. Repointing required for the worse existing mortar joints for amount indicated on drawing and provide an additional allowance of repointing equal to 10% of all stone to remain.
6. Scope of stone repairs as follows:
- a. Repairing cracks in masonry with cementitious injection grout as designated on the Drawings.
 - b. Shoring and repointing at limestone arches as designated on the Drawings.
 - c. Exposing, cleaning, and painting of embedded steel, and replacement of masonry as designated on the Drawings.
 - d. Dutchman repairs to granite spalls as designated on the Drawings.
 - e. Mortar patching and pinning at masonry spalls as designated on the Drawings.
 - f. Patching of masonry at removal of abandoned metal elements as designated on the Drawings.
7. Additional Repointing Requirements
- a. Comply with ASTM E 2260, Standard Guide for Repointing. (Tuckpointing) Historic Masonry.

1.3 REFERENCE STANDARDS

- A. Masonry Restoration shall conform to the Guidelines of the Secretary of the Interior for Historic Preservation. Techniques employed for masonry cleaning, pointing, and repair shall be as outlined in "Preservation Brief No, 1" (November 2000) as published by the National Park Service.
- B. ACI 530.1/ASCE 6/TMS 602 – Specification for Masonry Structures; American Concrete Institute International; 2008. Contractor shall maintain at least one copy of ACI / ASCE 530.1-88 on site.
- C. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures 2016.

1.4 SUBMITTALS

- A. Sustainable Design Submittals: Provide Sustainable Design Submittals in Accordance with Section 018113.
 - 1. General Emissions Evaluation: Paints and Coatings must be tested and determined compliant in accordance with California Department of Public Health (CDPH) Standard Method v1.2-2017, using the applicable exposure scenario. Show compliance with VOC limits as detailed in Section 01 8113 "VOC Limits". VOC Content Requirement for Wet Applied Products: All paints and coatings wet-applied on site must meet the applicable VOC limits of the California Air Resources Board (CARB) 2007, Suggested Control Measures (SCM) for Architectural Coatings, or the South Coast Air Quality Management District (SCAQMD) Rule 1113, effective February 5, 2016.
- B. Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- C. Product Data: Submit manufacturer's specifications and installation instructions for products used including finishing materials and methods.
- D. Submit manufacturer's technical data sheet for product indicated including recommendations for their application and use.
- E. Submit a work plan describing capture, storage, and disposal as required and/or governed by any and all local, state, and/or federal laws, codes, and regulations.
- F. Samples: Provide sample installation of product. Locations per the owner or owner's representative's directions.
- G. Product Data: Manufacturer's data including instructions, recommendations, and restrictions.
- H. Shop Drawings: Indicate setting details of stone. Detail shoring.
- I. Product Data: Provide data on each type of product indicated.
- J. Pre-Submittal Conference: Conduct coordination conference with attendance by representatives of Suppliers and Contractors to review proper methods and the procedures for cleaning masonry. No cleaning work shall begin until the Pre-Submittal Conference takes place.
- K. Sequence of Operations: The Contractor shall submit his proposed schedule and sequence of cleaning operations for review by the Professional and the Using Agent prior to beginning work. No cleaning work shall begin until the sequence of operations is approved.

- L. Product literature: The Contractor shall submit manufacturer's product literature for all cleaning products. Product literature shall include specification data, instructions for use and Material Safety Data Sheets.

1.5 SUBMITTALS FOR MASONRY REPAIR

- A. Product Data: The Contractor shall submit product literature for all manufactured mortar and stone patching materials. Literature shall indicate compliance with the referenced material standards and these specifications shall include, where applicable, manufacturer's instructions for application and use. Include test data substantiating that products comply with requirements.
- B. Qualification Data: For sub-contractor firms to demonstrate their capabilities and experience. Include list of completed projects with project names and addresses, names and addresses of architects and owners and other information specified.
- C. Description of Methods of Protection: Prior to commencement of cleaning operations, the Contractor shall submit to the Professional in writing a description of methods of protection of the public and of components of the building which are not to be cleaned. Contractor is required to mask windows from water or material infiltration during cleaning and clean-up any water or material which might enter the building. Contractor is required to protect any plaques or signs attached to the building with 2 layers of plastic for the duration of the masonry cleaning and restoration. Contractor is required to protect all light fixtures. Contractor is required to protect all equipment, louvers, etc. during the cleaning process. The method for securing the plastic shall be reviewed with the Professional before installation. Any tape residue that is left on the building or on a sign /plaque after the plastic has been removed shall also be cleaned/removed by the contractor with a method reviewed and approved by the Professional before proceeding with the work.
- D. Samples for verification:
 - 1. Each type of masonry unit to be used for replacing existing units. Include sets of samples as necessary to show the full range of shape, color, and texture to be expected.
 - 2. Each type, color and texture of pointing mortar in the form of sample mortar strips, 6 inches (150 mm) long by < 1/2 inch (6mm) wide, set in aluminum or plastic channels. Include with each sample a list of ingredients with proportions of each. Identify sources, both supplier and quarry, of each type of sand and brand names of cementitious materials and pigments if any. Have each set contain a close color range of at least three samples of different mixes of colored sands and cements that produce a mortar that matches the cleaned stone when cured and dry.
 - a. Limestone pointing mortar materials
 - b. Granite pointing materials
 - 3. Patching Compound: Submit sets of patching compound Samples in the form of plugs (patches in drilled holes) in sample units of stone representative of the range of stone colors on the building. Have each set contain a close color range of at least three samples of different mixes of patching compound that matches the variations in existing limestone patching mortar materials.
 - 4. Each type of adhesive.
 - 5. Accessories: Each type of anchor, accessory, and miscellaneous support.
 - 6. Limestone Dutchman materials.
 - 7. Granite Dutchman materials.

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene one week prior to commencing of each major part of the work of this section.
 - 1. Require attendance of parties directly affecting work of this section.
 - 2. Major part of the work of this section: Cleaning
 - a. Cleaning
 - b. Masonry repair and select replacement
 - c. Repointing
- B. Review conditions of installation, installation procedures, and coordination with related work.
- C. Review methods and procedures related to stone restoration and cleaning including, but not limited to, the following:
 - 1. Construction Schedule: Verify availability of materials, Restoration Specialist's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 2. Materials, material application, sequencing, tolerances, and required clearances.

1.3 QUALITY ASSURANCE - IN PLACE SAMPLES:

- A. Comply with Section 014516.13 Contractor's Quality Control.

1.4 QUALITY CONTROL

- A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.
- B. Restorer: Company specializing in masonry restoration with minimum three years of documented experience.
- C. The Contractor performing the work of this Section shall have a minimum of five years' experience in the cleaning of masonry materials similar to those required for this project and shall have successfully completed at least three projects of similar scope and size within the previous two years.
- D. Chemical-Cleaner Manufacturer Qualifications: A firm regularly engaged in producing masonry cleaners that have been used for similar applications with successful results, and with factory-trained representatives who are available for consultation and Project-site inspection and assistance at no additional cost.
- E. Cleaning and Repair Appearance Standard: Cleaned and repaired surfaces are to have a uniform appearance as viewed from 20 feet (6 m) away by The Professional. Perform additional paint and stain removal, general cleaning, and spot cleaning of small areas that are noticeably different, so that surface blends smoothly into surrounding areas.
- F. Consolidant Manufacturer Qualifications: A firm regularly engaged in producing stone consolidants that have been used for similar applications with successful results, and with factory-trained representatives who are available for consultation and Project-site inspection and assistance at no additional cost.

- G. Source Limitations: Obtain each type of material for stone repair (stone, cement, sand, etc.) from one source with resources to provide materials of consistent quality in appearance and physical properties.
- H. Cleaning and Repair Appearance Standard: Cleaned and repaired surfaces are to have a uniform appearance as viewed from 20 feet (6 m) away by The Professional. Perform additional paint and stain removal, general cleaning, and spot cleaning of small areas that are noticeably different, so that surface blends smoothly into surrounding areas.

1.5 QUALITY ASSURANCE - TEST PROCEDURES:

- A. Testing: Before production cleaning, test cleaners, cleaner concentrations, and cleaning techniques on small test samples at inconspicuous locations pre-approved by Owner and Architect.
 - 1. Before production cleaning: test cleaners, cleaner concentrations, and cleaning techniques on small test samples at inconspicuous locations pre-approved by Owner and Architect.
 - a. Repeat testing until successful cleaning is achieved, as judged by the Owner and Architect.
 - 2. Before production patching: test patching materials on small test samples at inconspicuous locations pre-approved by owner and Architect.
 - a. Repeat testing until successful repair patch is achieved, as judged by the Owner and Architect.
 - b. Test patch to include painted surface, applied to match surrounding color and sheen.
- B. Written Records: Provide detailed written records for each cleaning test, each cleaning condition, each substrate, and each contamination type.
 - 1. Record cleaner used, cleaner concentration, cleaning techniques, cleaner dwell time on surface, tools used, water temperature, water pressure, water volume, and other relevant information.
 - 2. Record patching material used, including paint color and sheen, and other relevant information.
 - 3. Use the Written Record to reproduce successful cleaning.
- C. Observation: Perform Quality Assurance Testing under direct observation of the Owner and Architect.

1.6 MOCK-UP

- A. Restore and repoint an existing masonry wall area sized 8 feet long by 6 feet high; include in mock-up area instances of mortar, accessories, wall openings, and flashings.
- B. Clean a 10 ft by 10 ft panel of wall to determine extent of cleaning.
- C. Locate where directed.
- D. Mock-up may remain as part of the Work.

1.7 TEST PANELS

- A. The Contractor, at locations designated by the Professional, shall prepare the following test panels for each of the cleaning methods specified for approval prior to commencing cleaning operations.
 - 1. Water Misting – 10 feet by 10 feet panel of limestone wall panel.
 - 2. Low Pressure Washing – 10 feet by 10 feet panel of limestone wall panel.
 - 3. Execution of this test panel shall determine the required dwell time for the remainder of this type of cleaning.
 - 4. Chemical Cleaning (Limestone) – 4'-0" x 4'-0" section
 - 5. Chemical Cleaning (Granite) – 4'-0" x 4'-0" section
 - 6. Rust Removal/Cleaning – 4'-0" x 4'-0" section

1.8 DELIVERY, STORAGE, HANDLING:

- A. Comply with Division 1 General Requirements and manufacturer's instructions and recommendations.
- B. Deliver cleaning chemicals to the site in the manufacturer's original containers with brand name and product identification information readily visible. Handle, store and protect all materials in such a manner as to prevent contamination and spillage thereof.
- C. Deliver masonry neatly stacked and tied on pallets. Store clear of ground with adequate waterproof covering.
- D. Store blast medium materials in manufacturer's packaging.

1.9 SITE/PROJECT CONDITIONS

- A. Cold and Hot Weather Requirements: Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.
- B. Do not blast clean or use process creating dust, dirt, when wind is over 10 mph.
- C. Weather Limitations: Proceed with the work only when existing and forecasted weather conditions permit masonry repair and masonry cleaning work to be performed according to manufacturer's written instructions and specified requirements except where the requirements of this section are more restrictive.
- D. The work of this Section shall be executed only when the air and surface temperatures are greater than 50 degrees F and rising or less than 90 degrees F and falling or within the ranges directed by the cleaning product manufacturer, where applicable. Minimum temperature for masonry cleaning shall be expected to remain above 50 degrees F for at least 2 hours after completion of the washing. In no case shall masonry cleaning be performed when freezing weather is expected within the 24 hours after completion.
- E. Comply with the requirements of all relevant Federal, State, and City Legislation related to the transportation, handling, use, and disposal of all cleaning materials as required by the authorities having jurisdiction.
- F. Contractor shall be responsible for controlling water flow from the cleaning and misting operations at the sidewalk level at all areas where there is public access. Daily cleanup of cleaning media and/or chemicals at building entrances and on portions of the sidewalk and surrounding areas shall be

provided.

- G. The Contractor is responsible for protecting existing adjacent materials during the execution of the work. Provide all necessary protection and work procedures to avoid damage to existing material assemblies not a part of the work of this Section. At a minimum, the Contractor shall:
 - 1. The Contractor shall be responsible for the removal of effluent from cleaning operations, waste materials, packaging and other debris associated with the work of this Section in a manner conforming with federal, state and local environmental regulations.
 - 2. Protect passing pedestrians and vehicles from overspray and wind drift during cleaning operations. Erect barricades and install yellow caution tape and signage as required to restrict access to work area.
 - 3. Protect all metal, glass and painted surfaces adjacent to areas to receive chemical cleaning or water repellent using plastic, plywood, sealants or other materials as required to prevent penetration of cleaning chemicals. The Contractor shall be responsible for surface etching and other damage caused to adjacent materials.
 - 4. Protect the bottom course of limestone cladding during the cleaning of the granite base. The Contractor shall be responsible for rectifying any staining or bleaching of the limestone due to over splash from the granite cleaning chemicals.
- H. The Contractor shall repair all damage to adjacent materials caused by the execution of the Work of this section at no expense to the Department. Damaged materials shall be repaired or replaced by mechanics experienced in the respective type of work, to the satisfaction of the Professional and Department.
- I. Prevent grout or mortar used in repointing and repair work from staining face of surrounding masonry and other surfaces. Remove immediately grout and mortar in contact with exposed masonry and other surfaces. Protect sills, ledges and projections from mortar droppings.

1.10 COORDINATION

- A. Coordinate stone restoration and cleaning with public circulation patterns at Project Site. Some work is near public circulation patterns. Public circulation patterns cannot be closed off entirely, and in places can only be temporarily redirected around small areas of work. Plan and execute the Work accordingly.

1.11 SEQUENCING AND SCHEDULING

- A. Perform stone repair work in the following sequence:
 - 1. Remove plant growth.
 - 2. Inspect for open mortar joints and repair before cleaning to prevent the intrusion of water and other cleaning materials into the wall.
 - 3. Remove paint and clean rust stains.
 - 4. Clean stone surfaces. Direct run-off away from building surface.
 - 5. Retain first subparagraph below if water repellents are part of Project.
 - 6. Repair stonework, including replacing existing stone with new stone material (Dutchman).
 - 7. Install composite patch material at areas indicated on the documents.
 - 8. Rake out mortar from joints to be repointed.
 - 9. Point mortar and sealant joints.
 - 10. After repairs and repointing have been completed and cured, perform a final cleaning to remove residues from this work.
 - 11. Coordinate the work of this section so repair work proceeds in a normal sequence and work does not interfere with work of other trades.

- B. As scaffolding is removed, patch anchor holes used to attach scaffolding. Patch holes in stone to comply with "Stone Patching" Article. Patch holes in mortar joints to comply with "Repointing Stonework" Article.

PART 2 - PRODUCTS

2.1 MASONRY MATERIALS

- A. Granite stone: Provide natural building stone of variety, color, texture, grain, veining, finish, size, and shape to match existing stone and with physical properties
 - 1. For existing stone that exhibits a range of colors, texture, grain, veining, finishes, sizes, or shapes, provide stone that proportionally matches that range rather than stone that matches an individual color, texture, grain, veining, finish, size, or shape within that range. Stone is to be standard grade free of cracks, seams, or starts which may impair integrity, appearance, or function and complying with the following ASTM performance standards:
 - 2. Density – 160 pounds per cubic foot, minimum
 - 3. Compressive Strength – 19,000 psi, minimum
- B. Limestone: Indiana (oolitic) limestone complying with the requirements of ASTM C568, Category II (medium density). Obtain limestone consistent with the color and texture range of the existing material. Stones shall be sound and free from cracks, chips, and other defects which may affect strength or appearance.
- C. Quarrying New Stone: Have quarry clearly label the direction of bedding planes when rough stone is quarried, to facilitate cutting stones so that natural bedding planes will be as required in "Cutting New Stone" Paragraph.
- D. Cutting New Stone: Regardless of how existing stone was cut and set, cut each new stone so that, when it is set in final position, natural bedding planes are essentially horizontal.

2.2 MORTAR MATERIALS

- A. Portland Cement: ASTM C 150, Type I, non-staining and without air entrapment. Gray and white Portland cement may be combined where required for color matching of exposed mortar.
 - 1. Provide cement containing not more than 0.60 percent total alkali when tested according to ASTM C 114.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Mortar Sand: ASTM C 144 unless otherwise indicated.
 - 1. Color: Provide natural sand of color necessary to produce required mortar color.
 - 2. For pointing mortar, provide sand with rounded edges.
 - 3. Match size, texture, and gradation of existing mortar sand as closely as possible. Blend several sands if necessary to achieve suitable match.
 - 4. Sand shall be free of silt, loam, soluble salts and organic matter. Sand shall be cleaned (properly washed) to not cause staining or streaking on the building face.
- D. Mortar Pigments: Natural and synthetic iron oxides, compounded for mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortars. Mortar pigments, if required to match the existing mortar, shall be a standard product manufactured by Solomon Grind-Chem Service, Riverton Lime Co., Medusa, or other approved manufacturer.
- E. Water: Potable, free from injurious amounts of oil, soluble salts, alkali, acids, organic impurities and

other deleterious materials.

- F. Admixtures: do not use admixtures of any kind in mortar, unless otherwise indicated and with Professional's approval.
- G. Aggregate for Mortar: ASTM C144 unless otherwise indicated.
 - 1. Color Mortar Aggregate: natural or manufactured sand to produce mortar color indicated to match size, texture and gradation of existing mortar as closely as possible.
- H. Mortar mixes:
 - 1. Mortar mix proportions for repointing granite:
 - a. 1 part by volume white Portland cement.
 - b. 1 part by volume hydrated lime.
 - c. 3 parts sand.
 - 2. Mortar mix proportions for repointing limestone:
 - a. 1 part by volume white Portland cement.
 - b. 1 part by volume hydrated lime.
 - c. 6 parts sand.
 - 3. Mortars for setting Dutchman:
 - a. Thin-set applications (joints less than 3/8" thick): Pointing mortar specified above, add Laticrete 4237 in accordance with manufacturer's instructions.

2.2 CEMENTITIOUS PATCHING MATERIALS AND MIXES

- A. Stone Patching Compound: Factory-mixed cementitious product that is custom manufactured for patching stone. Provide custom colored composite repair patching materials.
 - 1. Products: Subject to compliance with requirements, provide one of the following or equal as approved by the Professional:
 - a. Cathedral Stone Products, Inc.; Jahn Restoration Mortars.
 - b. Conproco Corporation; Mimic and/or Matrix.
 - c. Edison Coatings, Inc.; Custom System 45.
 - 2. Use formulation that is vapor and water permeable (equal to or more than the stone), exhibits low shrinkage, frost and salt resistant, has lower modulus of elasticity than the stone units being repaired, and develops high bond strength to all types of stone.
 - 3. Use formulation having working qualities and retardation control to permit forming and sculpturing where necessary.
 - 4. Formulate patching compound in colors, textures, and grain to match stone being patched. Provide five custom colors to enable matching each piece and type of stone.
 - 5. Follow manufacturer recommended mixing ratios.
- B. Cementitious Crack Filler: An ultrafine super plasticized grout that can be injected into cracks, is suitable for application to wet or dry cracks, exhibits low shrinkage, and develops high bond strength

to all types of stone.

1. Products: Subject to compliance with requirements, provide the following or equal as approved by the Professional:

- a. Cathedral Stone Products, Inc.; Jahn Injection Grout.
- b. Conproco Corporation; Terra Cotta Finish.
- c. Edison Coatings, Inc.; Pump-X 53-Series.

C. Stone-to-Stone Adhesive: Epoxy-resin stone adhesive with a 15-to 45-minute cure at 70 deg F or 1-part cementitious stone adhesive, recommended by adhesive manufacturer for type of stone repair indicated, and matching stone color.

1. Products: Subject to compliance with requirements, provide the following or equal as approved by the Professional:

a. Two-Part Polyester or Epoxy-Resin Stone Adhesive:

- 1) Akemi North America; Akepox
- 2) Bonstone Materials Corporation; Fast Set 41
- 3) Edison Coatings, Inc.; Flexi-Weld 520T

b. One-Part Cementitious Stone Adhesive:

- 1) Cathedral Stone Products, Inc.; Jahn Restoration Adhesive.

D. Stone Consolidation Treatment: Ready-to-use product designed for consolidation of stone that has deteriorated due to weathering and exposure to pollutants. Treatment shall be composed of silicic-ethyl esters, a neutral catalyst, and solvents.

1. Products: Subject to compliance with requirements, provide the following or equal as approved by the Professional:

- a. Akemi North America; Stone Strengthener K.
- b. Cohalan Company, Inc.; Keim Silex OH.
- c. Diedrich Technologies Inc.; D50C.
- d. HCT pretreatment in first subparagraph below is recommended by manufacturer for extremely deteriorated carbonate stones (marble and limestone). It forms a conversion layer, not film, on carbonate mineral grains, thereby increasing resistance to acid attack.
- e. PROSOCO; Conservare OH100 Stone Strengthener with HCT pretreatment.

2.3 PAINT REMOVERS

A. Alkaline Paste Paint Remover: Manufacturer's standard alkaline paste formulation for removing paint coatings from masonry.

1. Products: Subject to compliance with requirements, provide one of the following or equal as approved by the Professional:

- a. ABR Products, Inc.; 800 Brush Grade.
- b. Diedrich Technologies Inc.; 606 Multi-Layer Paint Remover or 606X Extra Thick Multi-

Layer Paint Remover.

- c. Hydroclean, Hydrochemical Techniques, Inc.; Hydroclean HT-716 Heavy Duty Paint Remover.
- d. PROSOCO; Sure Klean Heavy-Duty Paint Stripper.

B. Solvent-Type Paint Remover: Manufacturer's standard water-rinsable, solvent-type gel formulation for removing paint coatings from masonry.

- 1. Products: Subject to compliance with requirements, provide one of the following or equal as approved by the Professional:
 - a. ABR Products, Inc.; Super Bio Strip Gel.
 - b. Diedrich Technologies Inc.; 505 Special Coatings Stripper.
 - c. Dumond Chemicals, Inc.; Peel Away 2.
 - d. Hydroclean, Hydrochemical Techniques, Inc.; Hydroclean HT-300 Solvent Paint Remover.
 - e. Price Research, Ltd.; Price Strip-All.
 - f. PROSOCO; Sure Klean Fast Acting Stripper.

2.4 MIXING PROCEDURES

A. Pointing Mortar:

- 1. Mix mortar in accordance with ASTM C-270
- 2. Measure materials by volume or equivalent weight as indicated. Do not measure by shovel.
- 3. Mix ingredients in a clean mechanical batch mixer for 3 to 5 minutes.
- 4. Mortar shall stand for 20 minutes prior to use to allow for initial shrinkage. Place mortar in final position within two (2) hours of mixing. Do not retemper or use partially hardened mortar.

B. Patching Mortar

- 1. Mix patching mortar in accordance with the manufacturer's instructions. Add liquid to mortar material in a clean bucket and mix with trowel until all the dry material has been moistened. Do not mix more mortar than can be used in a 30 minute period.
- 2. Mortar is to be mixed to the proper consistency when a handful of material squeezed into a ball leaves little or no mortar residue on the hand.
- 3. All personnel to be involved in limestone patching work must complete certification coursework as required by the manufacturer.

2.5 ACCESSORY MATERIALS

A. Sealant Materials:

- 1. Provide manufacturer's standard chemically curing, elastomeric sealant(s) of base polymer and characteristics indicated below that comply with applicable requirements in Division 7 Section "Joint Sealants."
- 2. Colors: Provide colors of exposed sealants to match colors of stonework adjoining installed sealant unless otherwise indicated.

B. Joint-Sealant Backing:

- 1. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin) and of size and density to control sealant depth and otherwise contribute to producing optimum

- sealant performance.
2. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.
- C. Setting Buttons: Resilient plastic buttons, nonstaining to stone, sized to suit joint thicknesses and bed depths of stone units without intruding into required depths of pointing materials.
- D. Masking Tape: Nonstaining, nonabsorbent material, compatible with pointing mortar, joint primers, sealants, and surfaces adjacent to joints; that will easily come off entirely, including adhesive.
- E. Antirust Coating: Fast-curing, lead- and chromate-free, self-curing, universal modified-alkyd primer complying with SSPC-Paint 20 or SSPC-Paint 29 zinc-rich coating.
1. Use coating requiring no better than SSPC-SP 3, "Power Tool Cleaning" surface preparation according to manufacturer's literature or certified statement.
 2. Use coating with a VOC content of 420 g/L (3.5 lb/gal) or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- F. Miscellaneous Products: Select materials and methods of use based on the following, subject to approval of a mockup:
1. Previous effectiveness in performing the work involved.
 2. Little possibility of damaging exposed surfaces.
 3. Consistency of each application.
 4. Uniformity of the resulting overall appearance.
 5. Do not use products or tools that could do the following:
 - a. Remove, alter, or in any way harm the present condition or future preservation of existing surfaces, including surrounding surfaces not in contract.
 - b. Leave a residue on surfaces

2.6 MANUFACTURERS:

- A. Restoration and Cleaning Chemicals:
1. Prosoco, Inc. www.prosoco.com/#sle.
 2. Aqua Mix
 3. Chemique, Inc.
 4. Diedrich Technologies, Inc: www.diedrichtechnologies.com/#sle.
 5. HMK Stone Care System: www.hmkstonecare.com/#sle.
 6. Paint removal basis of design:
 - a. Prosoco, Inc. product Sure Klean Heavy Duty Paint Stripper Paint, Coating & Graffiti Removers
- B. Patching:
1. Basis of Design: 3M BONDO All Purpose Putty 3M Bondo
 2. Evercoat Polyester Glazing Putty, a division of Illinois Tool Works, Inc., Evercoat.
 3. Isopon Body Filler, manufactured by U-POL Ltd. U-POL

2.7 MASONRY CLEANING AND PATCHING MATERIALS GENERAL:

- A. Cleaners: Provide cleaners specifically manufactured for each substrate and soiling condition.
 - 1. Cleaning basis of design for quarry tile: "Aqua Mix 1 & 2 Deep Clean", Aqua Mix
 - 2. General cleaning basis of design for glazed block: "Sure Klean Vana Trol" by Prosoco.
 - 3. Rust Remover Basis of Design: Prosoco "Sure Klean Ferrous Stain Remover".
- B. Water: Clean, drinkable, and free of deleterious materials.
 - 1. 180 Degrees F Hot Water: Required for removal of paint, tar, and asphalt.
- C. Brushes: Soft bristle with fiber type recommended by cleaner manufacturer for each cleaner used.
- D. Pressure Cleaning Equipment:
 - 1. Pressure: 1,000 psi.
 - 2. Spray Tip: 15 degree spread.
 - 3. Water Flow Rate: 4 gallons per minute. https://www.3m.com/3M/en_US/bondo-us/

2.8 CLEANING MATERIALS

- A. CSP Cleaners
 - 1. CSP Bio-Cleaner should be used in their undiluted form. No acids, bases, caustics, solvents or other agents should be added. Products should be applied to limestone, unpolished granite, concrete, and other masonry surfaces. Acceptable products are available through Cathedral Stone Products. Tel: 410-782-9150; fax: 410-782-9155.
 - 2. Miscellaneous Equipment
 - a. Natural bristle brush
 - b. Paint roller
 - c. Airless sprayer
 - d. Clean rags
 - e. Latex gloves
 - f. Eye and skin protection
 - g. Garden hose with running water supply
 - h. Pressure washer using 600 to 1200 psi
 - i. Soft bristle scrub brush
- B. Limestone – Water Cleaning: Water shall be potable, non-staining and free of soluble salts, oils, organic matter and other substances deleterious to the surfaces to be cleaned. No detergents or other agents shall be added to cleaning water unless specifically directed by the Professional.
- C. Limestone, Granite and Concrete Cleaning – Light Duty Restoration Cleaner:
 - 1. ProSoCo, Inc.: EnviroKlean Saf Restorer
 - 2. Chemique: Artisan – Safer L/S Cleaner
 - 3. Cathedral Stone: masonRE B
 - 4. The product shall be used as packaged. Do not dilute or mix with other products.

- D. Iron Stains on Limestone – Ferrous Stain Remover
 - 1. ProSoCo, Inc.: SureKlean Ferrous Stain Remover
 - 2. Chemique: Artisan – Heavy Duty Rust Remover
 - 3. Cathedral Stone: masonRE Rust Remover
 - 4. The product shall be used as packaged, do not mix with other products. Dilute based on manufacturers requirements listed on product data sheet.

- E. Iron Stains on Granite – Ferrous Stain Remover: Cleaner as manufactured by:
 - 1. ProSoCo, Inc.
 - 2. Chemique: Artisan
 - 3. Cathedral Stone: masonRE
 - 4. The product shall be used as packaged, do not mix with other products. Dilute based on manufacturers requirements listed on product data sheet.

- F. Copper Stain Cleaning:
 - 1. ProSoCo, Inc.: T515 Copper Stain Remover
 - 2. Other Approved Equal
 - 3. The product shall be used as packaged, do not mix with other products. Dilute based on manufacturers requirements listed on product data sheet.

2.10 SKYWARD GRANITE MASONRY COATING

- A. Decorative protective coating for Parapet and as otherwise indicated on drawings:
 - 1. ELASTIDECK

PART 3 - EXECUTION

3.1 GENERAL

- A. Examination and Preparation
 - 1. Verify that surfaces to be cleaned are ready for work of this section.
 - 2. Protect surrounding elements from damage due to restoration procedures.
 - 3. Carefully remove and store removable items located in areas to be restored, including fixtures, fittings, finish hardware, and accessories; reinstall upon completion.
 - 4. Separate areas to be protected from restoration areas using means adequate to prevent damage.

- B. Mask immediately adjacent surfaces with material that will withstand cleaning and restoration procedures. The Contractor shall inspect the areas to be cleaned prior to commencing operations. All open joint, anchor penetrations and other openings shall be temporarily sealed using removable caulk to prevent penetration of water behind the stone cladding.

- C. Based on testing, cleaning is to be done in the following order:
 - 1. Water-Misting Cleaning
 - 2. Low Pressure Washing
 - 3. Light Duty Chemical Cleaning as Documented, up to three (3) applications as required, with

- cold water, low-pressure rinse after each application
4. Application of Ferrous Stain Removal as Documented

3.2 REPOINT EXISTING MASONRY

- A. General: Repoint joints in granite and limestone as shown on the Drawings.
 1. Perform repointing prior to cleaning masonry surfaces.
 2. Cut out loose or disintegrated mortar in joints to minimum 1/2 inch depth or until sound mortar is reached.
 3. Use power tools only after test cuts determine no damage to masonry units will result.
 4. Do not damage masonry units.
 5. When cutting is complete, remove dust and loose material by brushing.
 6. Premoisten joint and apply mortar. Pack tightly in maximum 1/4 inch layers. Form a smooth, compact concave joint to match existing.
 7. Moist cure for 72 hours.
 8. Immediately remove stains, efflorescence, or other excess resulting from the work of this section.
 9. Remove excess mortar, smears, and droppings as work proceeds and upon completion.
 10. Clean surrounding surfaces.
- B. Mortar: Mixing and Installation Procedures:
 1. In cold weather for exterior masonry, maintain the temperature of the mortar at time of use to above 50°F, but less than 85°F. Do not heat water.
 2. Measure cementitious and aggregate material in a dry condition by volume or equivalent weight. Do not measure by shovel, use known measure.
 3. Mix ingredients in clean mechanical batch mixer 3 to 5 minutes.
 4. Let setting mortar sit 20 minutes prior to use to allow for initial shrinkage.
 5. Repointing mortar shall be pre-hydrated to reduce shrinkage. Lime and sand shall be mixed with only enough water to produce an unworkable mix that will retain its shape.

3.3 MORTAR PATCHING – LIMESTONE CRACKS

- A. All cracks must be filled as noted on the Drawings. Cracks with existing patches which show visible signs of failure shall be removed and replaced. Prepare crack by removing all previous patching material or foreign debris. If crack is less than 1/8 inch wide, open up crack with a dremel tool with rotar top to a minimum width of 1/8 inch wide.
- B. Remove deteriorated material and remove adjacent material that has begun to deteriorate. Carefully remove additional material so patch will not have feathered edges but will have square or slightly undercut edges on areas to be patched and will be at least 1/2 inch thick, but not less than recommended by patching compound manufacturer.
- C. Thoroughly wet area to be patched to prevent suction of moisture from the patching material. Apply a slurry coat of mortar to the substrate.
- D. Install injection mortar material in layers to fill the required depth of crack in accordance with the manufacturer's published instructions. Roughen surface of each layer to provide a key for next layer.
 1. Trowel, scrape, or carve surface of patch to match texture and surrounding surface plane or contour of the stone. Shape and finish surface before or after curing, as determined by testing, to best match existing stone.

- 2. Build up < inch above surrounding stone and carve surface to match adjoining stone after patching compound has hardened.
- E. Keep the mortar patches damp for 72 hours using damp burlap, plastic sheeting, or other membrane as required.
- F. Remove and replace patches with hairline cracks or that show separation from stone at edges, and those that do not match adjoining stone in color or texture.

3.4 DUTCHMAN PATCHING – LIMESTONE AND GRANITE

- A. Remove damaged stone down to sound material and square up the edges of the area to be patched to form a neat rectangular opening. When patching granite, a core drill may be used to remove damaged material where the spalled area is small.
- B. Where there is an existing corroded anchor, wire brush or otherwise remove corrosion down to sound metal. Coat anchors with zinc based primer and allow to cure prior to installing Dutchman patch.
- C. Cut a piece of stone of a color and texture matching the original surface to fit the dimensions of the prepared area. A stone plug may be used for small granite patches only in lieu of a traditional Dutchman. Check the fit of the Dutchman prior to applying adhesive, making certain the contact surfaces of the repair stone fit tightly to minimize the appearance of the glue line. Where an entire stone is to be replaced, the Dutchman shall be sized to maintain the existing joint width and placement.
- D. Where the required Dutchman exceeds 100 square inches in area, stainless steel anchor pins will be required. The Contractor shall consult the Professional regarding the number and placement of stainless steel anchors.
- E. Apply adhesive carefully to the prepared opening, keeping adhesive away from exposed edges to minimize squeezing of the adhesive out of the joint and onto the stone surface. Insert the Dutchman into the prepared opening.
- F. After adhesive has set, grind or sand any excess Dutchman material down to the level of the adjoining surface. Using a fine abrasive, complete the sanding until the Dutchman is flush with the surrounding stone.
- G. Remove mortar from joints that abut area of stone removal to same depth as stone was removed. Remove loose mortar particles and other debris from surfaces to be bonded and surfaces of adjacent stone units that will receive mortar by cleaning with stiff-fiberbrush.
- H. Retain last option in first paragraph below for stone having bedding planes, usually sedimentary stone such as limestone and sandstone, unless this degree of control is considered unnecessary for dutchmen.
- I. Cut and trim partial replacement to accurately fit area where material was removed from backing stone. Fabricate to size required to produce joints between partial replacement and backing stone of no more than 1/16 inch (1.6 mm) in width, and joints between partial replacement and other stones that match existing joints between stones.
- J. Retain one of first two paragraphs below if large partial replacements that can accommodate pinning are required. Second paragraph might be required for noticeably patterned stones close to view, but is more difficult. Revise pin diameter, length, or spacing if required. Consider deleting third option in either paragraph and detailing pin layout on Drawings. If retaining either paragraph, verify that method is appropriate to type of stone used.

- K. Pinning: Before applying adhesive, prepare for mechanical anchorage consisting of 1/4-inch- (6-mm-) diameter, threaded stainless-steel pins set into 1/4-inch- (6-mm-) diameter holes drilled at a 45-degree downward angle through face of partial replacement and into backingstone. Center and space pins between 3 and 5 inches (75 and 125 mm) apart and at least 2 inches (50 mm) from any edge. Insert pins at least 2 inches (50 mm) into backing stone and 2 inches (50 mm) into partial replacement with end countersunk at least 3/4 inch (19 mm) from exposed face of partial replacement.
- L. Concealed Pinning: Before applying adhesive, prepare for concealed mechanical anchorage consisting of 1/4-inch- (6-mm-) diameter, threaded stainless-steel pins set into 1/4-inch- (6-mm-) diameter holes drilled into backing stone and into, but not through, the partial replacement. Center and space pins between 3 and 5 inches (75 and 125 mm) apart and at least 2 inches (50 mm) from any edge. Insert pins at least 2 inches (50 mm) into backing stone and 2 inches (50 mm) into partial replacement, but no closer than 3/4 inch (19 mm) from exposed face of partial replacement.
- M. Apply stone-to-stone adhesive to comply with adhesive manufacturer's written instructions. Coat bonding surfaces of backing stone and partial replacement, completely filling all crevices and voids.
- N. Apply partial replacement while adhesive is still tacky and hold securely in place until adhesive has cured. Use shims, clamps, wedges, or other devices as necessary to align face of partial replacement with face of backing stone.
- O. Retain option in paragraph below if retaining "Pinning" Paragraph.
- P. Clean adhesive residue from exposed surfaces and patch chipped areas and exposed drill holes.

3.5 GRANITE AND LIMESTONE REPOINTING

- A. Areas of granite and limestone masonry to be pointed are designated M1 on the Drawings. The extent of the work shall be reviewed with the Professional at the site before beginning operations.
- B. Rake designated mortar material out of the joints:
 1. For limestone, use a chisel less than $\frac{1}{4}$ inch in width. Do not use power-operated grinders without the Professional's written approval based upon approved quality- assurance program. Prying against the arrises of the building stones shall be avoided. Do not chip, spall, or cut into the edges of the stone with the chisel or the grinder. Clean all mortar from surfaces within the joint so that the new pointing bonds to the building stone rather than the old mortar.
 2. For granite, use a chisel less than $\frac{1}{4}$ inch in width or by mechanical grinding using a carborundum blade. For mechanical grinders, cut out center of mortar bed joints with carborundum blade and remove remaining mortar by hand with chisel and resilient mallet. Prying against the arrises of the building stones shall be avoided. Do not chip, spall, or cut into the edges of the stone with the chisel or the grinder. Clean all mortar from surfaces within the joint so that the new pointing bonds to the building stone rather than the old mortar.
 3. Do not spall edges or widen joints.
- C. Notify the Professional of unforeseen detrimental conditions including voids in mortar joints, cracks, loose stone, rotted wood, rusted metal, and other deteriorated items.
- D. If work is found to be unacceptable, all raking will cease without additional cost to the Department until deficiencies in tools, workmanship, or methodology have been corrected to the Professional's satisfaction.
- E. Rake back a minimum of $\frac{1}{4}$ inch to sound mortar. Brush, vacuum, or blow joints clean with

compressed air to remove sediment and debris. Do not use water to remove sediment and debris from the mortar joint.

- F. Apply new mortar in < inch thick layers, allowing each layer to reach initial set/thumb-print hardness before applying succeeding layers. Work mortar into the full depth of the joint using a flexible tool.
- G. When final layer of mortar is thumb-print hard, tool joint as required to match the existing profile. Avoid feather-edging of joints. Remove and dispose of excess mortar promptly before it can set or stain masonry.
- H. Keep joints damp for 72 hours after repointing using damp burlap, plastic, or other waterproof membrane. Adjust curing methods to ensure that pointing mortar is damp throughout its depth without eroding surface mortar.
- I. Hairline cracking within the mortar or mortar separation at edge of a joint is unacceptable. Completely remove such mortar and repoint.
- J. The Contractor shall leave the granite and limestone surface clean of mortar, grease, or other spots. Any compounds proposed for cleaning stains shall be approved by the Professional prior to use.
- K. Pointing with Sealant – for use at the meeting of dissimilar materials and at wash joints:
 - 1. After raking out, keep joints dry and free of mortar and debris.
 - 2. Clean and prepare joint surfaces according to Division 7 Section "Joint Sealants." Prime joint surfaces unless sealant manufacturer recommends against priming. Do not allow primer to spill or migrate onto adjoining surfaces.
 - 3. Fill sealant joints with specified joint sealant according to Division 7 Section "Joint Sealants" and the following:
 - a. Install cylindrical sealant backing beneath the sealant except where space is insufficient. There, install bond-breaker tape.
 - b. Install sealant using only proven installation techniques that will ensure that sealant will be deposited in a uniform, continuous ribbon, without gaps or air pockets, and with complete wetting of the joint bond surfaces equally on both sides. Fill joint flush with surrounding stonework and matching the contour of adjoining mortar joints.
 - c. Install sealant as recommended by sealant manufacturer but within the following general limitations, measured at the center (thin) section of the bead:
 - d. Fill joints to a depth equal to joint width, but not more than 1/2 inch (13 mm) deep or less than 1/4 inch (6 mm) deep.
 - e. Immediately after first tooling, apply ground-mortar aggregate to sealant, gently pushing aggregate into the surface of sealant. Retool sealant to form smooth, uniform beads, slightly concave. Remove excess sealant and aggregate from surfaces adjacent to joint.
 - f. Do not allow sealant to overflow or spill onto adjoining surfaces, or to migrate into the voids of adjoining surfaces, particularly rough textures. Remove excess and spillage of sealant promptly as the work progresses. Clean adjoining surfaces by the means necessary to eliminate evidence of spillage, without damage to adjoining surfaces or finishes, as demonstrated in an approved mockup.
 - 4. Cure sealant according to Division 7 Section "Joint Sealants."
- L. Where repointing work precedes cleaning of existing stone, allow mortar to harden at least 30 days

before beginning cleaning work.

3.6 GRANITE TOOLING

- A. Areas of deteriorated granite to be tooled are designated on the Drawings. The extent of the work shall be reviewed with the Professional at the site before beginning operations.
- B. Rub all deteriorated granite with granite gneiss block with round edges (or stone material that is softer and more friable than granite). Remove all loose and friable material on the surface of the granite. Rub all rough edges to sound and smooth surface.

3.7 SELECTIVE MASONRY REMOVALS

- A. Cut masonry units with motor-driven saws to provide clean, sharp, unchipped edges. Cut at joints wherever possible and as required to accept new masonry openings as indicated.
- B. Salvage masonry units being removed to the greatest extent possible for re-use as Dutchmen at other areas of the building.

3.8 PROTECTION

- A. Protect persons, motor vehicles, surrounding surfaces of building being restored, building site, plants, and surrounding buildings from harm resulting from stone restoration work.
 - 1. Erect temporary protective covers over walkways and at points of pedestrian and vehicular entrance and exit that must remain in service during course of restoration and cleaning work.
- B. Prevent mortar from staining face of surrounding stone and other surfaces.
 - 1. Cover sills, ledges, and projections to protect from mortar droppings.
 - 2. Keep wall area wet below rebuilding and pointing work to discourage mortar from adhering.
 - 3. Immediately remove mortar in contact with exposed stone and other surfaces.
 - 4. Clean mortar splatters from scaffolding at end of each day.

3.10 UNUSED ANCHOR REMOVAL

- A. Remove stone anchors, brackets, wood nailers, and other extraneous items no longer in use unless identified as historically significant or indicated to remain.
 - 1. Remove items carefully to avoid spalling or cracking stone.
 - 2. Where directed, if an item cannot be removed without damaging surrounding stone, do the following:
 - a. Cut or grind off item approximately 3/4 inch (20 mm) beneath surface and core drill a recess of same depth in surrounding stone as close around item as practical.
 - b. Immediately paint exposed end of item with two coats of antirust coating, following coating manufacturer's written instructions and without exceeding manufacturer's recommended dry film thickness per coat. Keep paint off sides of recess.
 - 3. Patch the hole where each item was removed unless directed to remove and replace the stone unit.

3.11 STONE REMOVAL AND REPLACEMENT

- A. At locations indicated, remove stone that has deteriorated or is damaged beyond repair. Carefully demolish or remove entire units from joint to joint, without damaging surrounding stone, in a manner that permits replacement with full-size units.
- B. Support and protect remaining stonework that surrounds removal area. Maintain flashing, reinforcement, lintels, and adjoining construction in an undamaged condition.
- C. Notify Professional of unforeseen detrimental conditions including voids, cracks, bulges, and loose units in existing stone or unit masonry backup, rotted wood, rusted metal, and other deteriorated items.
- D. Remove in an undamaged condition as many whole stone units as possible.
 - 1. Remove mortar, loose particles, and soil from stone by cleaning with hand chisels, brushes, and water.
 - 2. Remove sealants by cutting close to stone with utility knife and cleaning with solvents.
 - 3. Store stone for reuse. Store off ground, on skids, and protected from weather.
 - 4. Deliver cleaned stone not required for reuse to the Department unless otherwise indicated.
- E. Clean stone surrounding removal areas by removing mortar, dust, and loose particles in preparation for replacement.
- F. Replace removed damaged stone with other removed stone in good quality, where possible, or with new stone matching existing stone, including size. Do not use broken units unless they can be cut to usable size.
- G. Do not allow face bedding of stone. Before setting, inspect to verify that each stone has been cut so that, when it is set in final position, natural bedding planes are essentially horizontal. Reject and replace stone with vertical bedding planes except as required for arches, lintels, and copings.
- H. Install replacement stone into bonding and coursing pattern of existing stone. If cutting is required, use a motor-driven saw designed to cut stone with clean, sharp, un-chipped edges. Finish edges to blend with appearance of edges of existing stone.
 - 1. Maintain joint width for replacement stone to match existing joints.
 - 2. Use setting buttons or shims to set stone accurately spaced with uniform joints.
- I. Set replacement stone with completely filled bed, head, and collar joints. Butter vertical joints for full width before setting and set units in full bed of mortar unless otherwise indicated. Replace existing anchors with new anchors of size and type indicated.
 - 1. Tool exposed mortar joints in repaired areas to match joints of surrounding existing stonework.
 - 2. Retain subparagraph above or first subparagraph below. Coordinate with mortar mixes in Part 2.
 - 3. Rake out mortar used for laying stone before mortar sets and point new mortar joints in repaired area to comply with requirements for repointing existing stone, and at same time as repointing of surrounding area.
 - 4. When mortar is sufficiently hard to support units, remove shims and other devices interfering with pointing of joints.

3.12 PAINTING STEEL UNCOVERED DURING THE WORK

- A. Inspect steel exposed during stone removal. Where The Professional determines that it is structural, or for other reasons cannot be totally removed, prepare and paint it as follows:
 - 1. Remove paint, rust, and other contaminants as applicable to meet paint manufacturer's recommended preparation.
 - 2. Immediately paint exposed steel with two coats of antirust coating, following coating manufacturer's written instructions and without exceeding manufacturer's recommended rate of application (dry film thickness per coat).
- B. If on inspection and rust removal, the cross section of a steel member is found to be reduced from rust by more than 1/16 inch (1.6 mm) notify The Professional before proceeding.

3.13 STONE PLUG REPAIR

- A. Remove cylindrical piece of damaged stone by core-drilling perpendicular to stonesurface.
- B. Prepare a replacement plug by core-drilling replacement stone. Use a drill sized to produce a core that will fit into hole drilled in damaged stone with only minimum gap necessary for adhesive. Cut and install plug so that, when it is set in final position, natural bedding planes will match the orientation of bedding planes of the backing stone unless otherwise indicated.
- C. Apply stone-to-stone adhesive to comply with adhesive manufacturer's written instructions. Coat bonding surfaces of existing stone and plug, completely filling all crevices and voids.
- D. Apply plug while adhesive is still tacky and hold securely in place until adhesive has cured.
- E. Clean adhesive residue from exposed surfaces.

3.14 STONE-FRAGMENT REPAIR

- A. Carefully remove cracked or fallen stone fragment indicated to be repaired. Reuse only stone fragment that is in sound condition.
- B. Remove soil, loose particles, mortar, and other debris or foreign material, from fragment surfaces to be bonded and from parent stone where fragment had broken off, by cleaning with stiff-fiber brush.
- C. Pinning: Before applying adhesive, prepare for mechanical anchorage consisting of 1/4-inch- (6-mm-) diameter, threaded stainless-steel pins set into 1/4-inch- (6-mm-) diameter holes drilled at a 45-degree downward angle through face of fragment and into parent stone. Center and space pins between 3 and 5 inches (75 and 125 mm) apart and at least 2 inches (50 mm) from any edge. Insert pins at least 2 inches (50 mm) into parent stone and 2 inches (50 mm) into fragment with end countersunk at least 3/4 inch (19 mm) from exposed face of fragment.
- D. Concealed Pinning: Before applying adhesive, prepare for concealed mechanical anchorage consisting of 1/4-inch- (6-mm-) diameter, threaded stainless-steel pins set into 1/4-inch- (6-mm-) diameter holes drilled into parent stone and into, but not through, the fragment. Center and space pins between 3 and 5 inches (75 and 125 mm) apart and at least 2 inches (50 mm) from any edge. Insert pins at least 2 inches (50 mm) into parent stone and 2 inches (50 mm) into fragment, but no closer than 3/4 inch (19 mm) from exposed face of fragment.
- E. Apply stone-to-stone adhesive to comply with adhesive manufacturer's written instructions. Coat bonding surfaces of fragment and parent stone, completely filling all crevices and voids.

- F. Fit stone fragment onto parent stone while adhesive is still tacky and hold fragment securely in place until adhesive has cured. Use shims, clamps, wedges, or other devices as necessary to align face of fragment with face of parent stone.
- G. Clean adhesive residue from exposed surfaces and patch chipped areas and exposed drill holes.

3.15 CRACK INJECTION

- A. General: Comply with cementitious crack-filler manufacturer's written instructions.
- B. Drill 1/4-inch- (6-mm-) diameter injection holes as follows:
 - 1. Transverse Cracks Less Than 3/8 inch (9 mm) Wide: Drill holes through center of crack at 12 to 18 inches (300 to 500 mm) o.c.
 - 2. Transverse Cracks More Than 3/8 inch (9 mm) Wide: Drill holes through center of crack at 18 to 36 inches (500 to 900 mm) o.c.
 - 3. Delaminations: Drill holes at approximately 18 inches (500 mm) o.c. both vertically and horizontally.
 - 4. Drill holes 2 inches (50 mm) deep. Where possible drill holes in mortar joints.
- C. Clean out drill holes and cracks with compressed air and water. Remove dirt and organic matter, loose material, sealants, and failed crack repair materials.
- D. Place plastic injection ports in drilled holes and seal face of cracks between injection ports with clay or other non-staining, removable plugging material. Leave openings at upper ends of cracks for air release.
- E. Inject cementitious crack filler through ports sequentially, beginning at one end of area and working to opposite end; where possible, begin at lower end of injection area and work upward. Inject filler until it extrudes from adjacent ports. After port has been injected, plug with clay or other suitable material and begin injecting filler at adjacent port, repeating process until all ports have been injected.
- F. Clean cementitious crack filler from face of stone before it sets by scrubbing with water.
- G. After cementitious crack filler has set, remove injection ports, plugging material, and excess filler. Patch injection holes and surface of cracks as specified in "Stone Patching" Article.

3.16 STONE CONSOLIDATION TREATMENT

- A. Apply treatment to clean, dry surfaces according to manufacturer's written instructions. Remove areas of blind exfoliation, delamination, and flaking before applying.
- B. Apply in cycles to small sections of stonework, not more than 100 sq. ft. (9 sq. m) in area. Each cycle shall consist of 3 successive saturating applications, applied at 5- to 15-minute intervals depending on drying conditions.
- C. Apply by low-pressure spray to point of rejection in each application. Apply from bottom of section to top.
- D. Apply 3 cycles, allowing treated surface to dry for 60 to 90 minutes between cycles.
- E. Protect treated surfaces from rain for 48 hours after treatment.
- F. Allow treated surfaces to dry for at least 21 days before repointing, patching, or applying water

repellents or sealants.

3.17 CLEANING AFTER STONE REPAIR

- A. After mortar has fully hardened, thoroughly clean exposed stone surfaces of excess mortar and foreign matter; use wood scrapers, stiff-nylon or -fiber brushes, and clean water spray applied at low (100 psi) pressure.
 - 1. Do not use metal scrapers or brushes.
 - 2. Do not use acidic or alkaline cleaners.
- B. Coordinate final rinse with completion of masonry repair work.
- C. Remove all protection erected as part of cleaning operations.
- D. Clean all surfaces at grade level and below, including all areaways that may have been affected by the cleaning operation.
- E. Paragraphs below are examples only; revise to suit Project.
- F. Wash adjacent woodwork and other non-stone surfaces. Use detergent and soft brushes or cloths.
- G. Clean mortar and debris from roof; remove debris from gutters and downspouts. Rinse off roof and flush gutters and downspouts.
- H. Sweep and rake adjacent pavement and grounds to remove mortar and debris. Where necessary, pressure wash pavement surfaces to remove mortar, dust, dirt, and stains.
- I. As the blocking and other related components associated with the scaffolding system are removed from the masonry surface, the exposed surfaces behind the component are to be cleaned with the low-pressure mild abrasive system.

3.18 MASONRY CLEANING:

- A. Comply with cleaner manufacturer's instructions and recommendations.
- B. Effectively protect glass and adjacent substrates from cleaning chemicals and cleaning processes.
- C. Wet surfaces to be cleaned before application of cleaning solutions.
- D. Mix cleaner with water as recommended by cleaner manufacturer.
- E. Apply cleaning solution then work cleaner solution into surface by hand with soft brush.
- F. Work cleaner into all cracks, crevices, and details.
- G. Gently agitate the surface and lift contamination.
- H. Allow cleaner to dwell on the surface for time period used for Quality Assurance Testing - Successful Cleaning. Follow the Written Record.
- I. Do not allow cleaner to dry on the surface.
- J. Rinse thoroughly and completely with water volumes, temperatures, and pressures used for Quality Assurance Testing. Follow the Written Record.

- K. Gently agitate the surface with hand brushes while rinsing.
- L. Keep pressure washer spray nozzle, if used, = 8 inches from the surface.
- M. Repeat cleaning until acceptable cleaning is achieved.
- N. Do not damage substrates.
- O. Do not “bleach”, streak, or change actual substrate colors.
- P. Protect all work areas and adjacent areas from bleaching, streaking, soiling and staining.
- Q. Do not damage masonry, mortar, or any surface with high pressure water.
- R. Match approved In Place Samples.

3.19 GENERAL APPLICATION of CSP BIO-CLEANER

- A. Follow instructions provided by the manufacturer (See Data Sheet).
- B. Clearly mark or identify the time of application and dwell time.
- C. Apply cleaner using a brush, roller, or airless sprayer to the desired thickness. Thicknesses of cleaner on test patches will determine appropriate thickness.
- D. Leave cleaner on substrate only as long as determined acceptable in the mock-ups and approved by the owner or their representatives.
- E. If the approved dwell time has elapsed and a stain or blemish persists use a soft bristle scrub brush to agitate the area.
- F. Apply a small amount of CSP Bio-Cleaner to the brush then scrub the area again to facilitate in the removal of the stain if necessary.
- G. Follow instructions provided by the manufacturer (See Data Sheet).
- H. Begin at the top of each section and pressure wash the cleaner and residue off the substrate. Use appropriate pressure as determined in the mock-up.
- I. Pressure wash should be performed at a pressure which will not damage the substrate yet provide adequate removal of cleaner and residue.
- J. Be sure all of the cleaner and residue are washed off the substrate.
- K. Exercise caution during cleaning operations to avoid wind drift of materials to adjacent properties, persons, or cars below. Schedule cleaning operations for times or days when risk to pedestrians or vehicles is at a minimum.
- L. Use only methods and materials determined during testing phase and approved by owner’s representative. Clean surface to degree accepted by owner’s representative. Do not permit cleaning to continue if methods and materials employed results in any permanent damage to surfaces.
- M. Contractor shall reclaim, characterize and dispose of all waste and residue used in conjunction with this project in accordance with applicable laws. Disposal sites shall be approved by the owner’s representative.
- N. During the work, remove from the site discarded cleaning and coating materials, rubbish, cans and

rag at the end of each workday.

- O. Upon completion of work, remove all protective coverings and coatings, and clean window glass and other spattered surfaces. Remove spattered coatings by proper methods as recommended by manufacturer, using care not to damage adjacent surfaces.

3.20 WATER-MISTING CLEANING

- A. The Contractor shall protect all building components against damage from weight of suspended cleaning apparatus and against scratching or abrasion damage from protruding parts.
- B. Windows and window frames shall be protected using polyethylene and temporary sealants as required during water misting. The Contractor shall maintain at least one employee on the interior of the building to monitor window and wall conditions during cleaning. Water spray shall cease immediately if leakage is discovered inside the building and shall not resume until the cause is identified and corrected.
- C. Water shall be supplied through nebulizing nozzles to produce a fine mist. The quantity of water delivered to each spray head shall not exceed 15 gallons per hour. The spacing of the spray heads shall be 12" on centers minimum.
- D. Washing shall occur at intervals of one hour on and two hours off during daylight hours. No washing shall be permitted at night.

3.21 LOW PRESSURE WASHING

- A. Pressure washing of designated areas shall proceed from the bottom of the area to the top.
- B. Using a nozzle pressure of 800 psi or less (based on the results of the test panel) and a fan tipped spray nozzle, the water spray shall be directed at the stone surface from a distance of not less than 12 inches.

3.22 CHEMICAL CLEANING (LIMESTONE, and GRANITE)

- A. Chemical cleaning of designated areas shall proceed from the bottom of the area to the top. Wet surfaces to be cleaned thoroughly prior to application of cleaning chemicals to prevent excessive absorption into the stone.
- B. Apply specified cleaning product in accordance with the manufacturer's printed instructions. Do not exceed recommended solution concentrations or dwell times. Cleaning solutions shall be applied by hand using a fiber brush or sponge. Cleaning solutions may not be applied using pressure washing equipment.
- C. Allow cleaner to dwell on the stone in accordance with the manufacturer's printed instructions. Reapply and scrub stubborn stains.
- D. Rinse all cleaned areas thoroughly to remove all traces of cleaner from cracks and corners. Rinse down adjacent materials to prevent discoloration or streaking from cleaning chemicals.

3.23 FERROUS STAIN REMOVAL

- A. In a plastic bucket or container, combine poultice ingredients in accordance with manufacturer's printed instructions. Stir continuously until the mixture forms a smooth, wet paste.
- B. Apply a layer of poultice paste, 1/8" to 1/4" in thickness, immediately to the stained

surface. Surfaces to be cleaned should be dry and free of surface dirt and dust.

- C. Cover with plastic. Leave poultice paste on the masonry for 24 hours or until completely dry.
- D. Once the poultice is completely dried, scrape mixture from the surface using wood, plastic or rubber spatulas. Rinse the treated area thoroughly with water and a soft brush to remove remaining residue.

3.24 COPPER STAIN REMOVAL

- A. In a plastic bucket or container, combine poultice ingredients in accordance with manufacturer's printed instructions. Stir continuously until the mixture forms a smooth, wet paste.
- B. Apply a layer of poultice paste, 1/8" to 1/4" in thickness, immediately to the stained surface. Surfaces to be cleaned should be dry and free of surface dirt and dust.
- C. Cover with plastic. Leave poultice paste on the masonry for 24 hours or until completely dry.
- D. Once the poultice is completely dried, scrape mixture from the surface using wood, plastic or rubber spatulas. Rinse the treated area thoroughly with water and a soft brush to remove remaining residue.

3.25 CLEAN-UP AND SITE RESTORATION

- A. Excess materials shall be removed from the site. Do not dump excavation around building or on site.
- B. Remove Temporary sealants around window and door openings.
- C. Remove splatters from building immediately.

END OF SECTION

SECTION 042200 - CONCRETE UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Concrete masonry units.
2. Decorative and Acoustic concrete masonry units
3. Mortar and grout.
4. Steel reinforcing bars.
5. Masonry-joint reinforcement.
6. Miscellaneous masonry accessories.

B. Related Requirements:

1. Section 017419 "Construction Waste Management and Disposal."
2. Section 018113 "Sustainable Design Requirements."
3. Section 047200 "Cast Stone Masonry"
4. Section 071900 "Water Repellants" for graffiti control coatings on Masonry
5. Section 072100 "Thermal Insulation" for cellular glass insulation used as setting blocks for CMU below grade.
6. Section 076200 "Sheet Metal Flashing and Trim" for sheet metal flashing installed in masonry joints.

1.2 PREINSTALLATION MEETINGS

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

1.3 ACTION SUBMITTALS

- A. Sustainable Design Submittals: Provide Sustainable Design Submittals in Accordance with Section 018113.

1. Building Product Disclosure Requirements: To encourage the use of building products that are working to minimize their environmental and health impacts, provide the following information when available:
 - a. Environmental Product Declaration: Submit with Product-specific Type III or Industry-wide Type III Environmental Product Declaration (EPD).
2. Recycled Content: The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.
3. Regional Materials: Materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles (160 km) of Project Site. If only a fraction of a product or material is extracted/harvested/recovered and manufactured locally, then only that percentage (by weight) shall contribute to the regional value.

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

- C. Shop Drawings: For the following:

1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
2. Reinforcing Steel: Detail bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315. Show elevations of reinforced walls.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Material Certificates: For each type and size of the following:
 1. Masonry units.
 - a. Include data on material properties.
 - b. For masonry units, include data and calculations establishing average net-area compressive strength of units.
 2. Cementitious materials. Include name of manufacturer, brand name, and type.
 3. Mortar admixtures.
 4. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
 5. Grout mixes. Include description of type and proportions of ingredients.
 6. Reinforcing bars.
 7. Joint reinforcement.
 8. Anchors, ties, and metal accessories.
- C. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
 1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91/C 91M for air content.
 2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.
- D. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to TMS 602/ACI 530.1/ASCE 6.
- E. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM C 1093 for testing indicated.

- B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution
 - 1. Building mockups for typical interior and exterior walls in sizes approximately 72 inches long by 60 inches high by full thickness including face and backup wythes and accessories.
 - a. Include a sealant-filled joint at least 16 inches long in each mockup.
 - b. Include through-wall flashing installed for a 24-inch length in corner of exterior wall mockup approximately 16 inches down from top of mockup, with a 12-inch length of flashing left exposed to view (omit masonry above half of flashing).
 - 2. Protect accepted mockups from the elements with weather-resistant membrane.
 - 3. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.7 FIELD CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
 - 1. Extend cover a minimum of 24 inches (600 mm) down both sides of walls, and hold cover securely in place.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.
- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
 - 1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.

2. Protect sills, ledges, and projections from mortar droppings.
 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.
1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.
- E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.
- B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

2.2 PERFORMANCE REQUIREMENTS

- A. Provide unit masonry that develops indicated net-area compressive strengths at 28 days.
 1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to TMS 602/ACI 530.1/ASCE 6.

2.3 UNIT MASONRY, GENERAL

- A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6 except as modified by requirements in the Contract Documents.
- B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work.
- C. Fire-Resistance Ratings: Comply with requirements for fire-resistance-rated assembly designs indicated.

1. Where fire-resistance-rated construction is indicated, units shall be listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction.

2.4 CONCRETE MASONRY UNITS

- A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
 2. Provide bullnosed units for outside corners unless otherwise indicated.
 3. Provide solid units for vertical units or other special conditions as indicated
- B. CMUs: ASTM C 90. Use only two-cell CMUs for masonry construction.
1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 3050 psi (21.0 MPa).
 2. Density Classification: Lightweight.
 3. Size (Width): Manufactured to dimensions 3/8 inch (10 mm) less-than-nominal dimensions.
- C. Decorative CMUs: ASTM C 90
1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 3050 psi (21.0 MPa).
 2. Density Classification: Lightweight
 3. Size (Width): Manufactured to dimensions 3/8 inch (10 mm) less-than-nominal dimensions.
 4. Pattern and Texture:
 - a. Exterior CMUs (CMU-1):
 - 1) Color and Texture: Westbricks Smooth Moulded; Granite: ASTM C90 and C744
 - 2) Size: Nominal 4"x8"x16"
 - 3) Bond Pattern: As indicated on drawings
 - b. Interior CMUs (CMU-2; Gymnasium)
 - 1) Color and Texture:
 - a) Type 1: Westbricks Smooth Moulded; City (70% of field mix): ASTM C90 and C744
 - b) Type 2: Westbricks Groundfaced; City (30% of field mix): ASTM C90 and C744
 - 2) Size: Nominal 8"x8"x16"
 - 3) Bond Pattern: Running bond

- c. Interior CMUs (CMU-3; Addition Lobby)
 - 1) Color and Texture: Westbricks Groundfaced Block: City: ASTM C90 and C744
 - 2) Size: Nominal 8"x8"x16"
 - 3) Bond Pattern: Running bond
- d. Interior CMUs (CMU-4); Acoustic CMUs at Gymnasium): ASTM C 90 or C129
 - 1) Color and Texture: SOUNDBLOX Type RSC-RF Smooth Moulded: City
 - 2) Size: Nominal 8"x8"x16"
 - 3) Bond Pattern: Running bond
- D. Accessory Units: Provide units as required for window sills and jambs, doors, control joints, bond beams, lintels, pilaster, caps and other locations as indicated on Drawings with a minimum of block cutting. Accessory units shall match adjacent unit color and texture unless otherwise noted. Units shall match samples submitted to Architect for review.
- E. Special Units for Reinforced CMU: Provide in locations indicated, to control location of horizontal and vertical reinforcing. Comply with requirements indicated for concrete masonry units and the following:
 - 1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 3500 psi.
 - 2. Weight Classification: Lightweight.

2.5 CONCRETE AND MASONRY LINTELS

- A. General: For exposed conditions, provide masonry lintels complying with requirements below. For concealed conditions, provide either concrete or masonry lintels, at Contractor's option, complying with requirements below.
- B. Concrete Lintels: ASTM C 1623, matching CMUs in color, texture, and density classification; and with reinforcing bars indicated. Provide lintels with net-area compressive strength not less than that of CMUs.
- C. Concrete Lintels: Precast or formed-in-place concrete lintels complying with requirements in Section 033000 "Cast-in-Place Concrete," and with reinforcing bars indicated.
- D. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMUs matching adjacent CMUs in color, texture, and density classification, with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

2.6 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C 150/C 150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
- B. Hydrated Lime: ASTM C 207, Type S.

- C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
- D. Aggregate for Mortar: ASTM C 144
 - 1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
 - 2. For joints less than 1/4 inch (6 mm) thick, use aggregate graded with 100 percent passing the No. 16 (1.18-mm) sieve.
- E. Aggregate for Grout: ASTM C 404.
- F. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Euclid Chemical Company (The); Accelguard 80.
 - b. GCP Applied Technologies, Inc.; Morset.
 - c. Sonneborn Products, BASF Aktiengesellschaft; Trimix-NCA.
- G. Water: Potable.

2.7 REINFORCEMENT

- A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60 (Grade 420).
- B. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and to hold reinforcing bars in center of cells. Units are formed from 0.148-inch (3.77-mm) steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Dayton Superior Corporation, Dur-O-Wal Division; D/A 810, D/A 812 or D/A 817.
 - b. Heckmann Building Products Inc.; No. 376 Rebar Positioner.
 - c. Hohmann & Barnard, Inc.; #RB or #RB-Twin Rebar Positioner.
 - d. Wire-Bond; O-Ring or Double O-Ring Rebar Positioner.
- C. Masonry-Joint Reinforcement, General: Ladder type complying with ASTM A 951/A 951M.
 - 1. Interior Walls: Hot-dip galvanized carbon steel.
 - 2. Exterior Walls: Hot-dip galvanized carbon steel.
 - 3. Wire Size for Side Rods: 0.148-inch (3.77-mm) diameter, 9 gauge.
 - 4. Wire Size for Cross Rods: 0.148-inch (3.77-mm) diameter, 9 gauge.
 - 5. Spacing of Cross Rods: Not more than 16 inches (407 mm) o.c.

6. Provide in lengths of not less than 10 feet (3 m), with prefabricated corner and tee units.

2.8 TIES AND ANCHORS

- A. General: Ties and anchors shall extend at least 1-1/2 inches (38 mm) into masonry but with at least a 5/8-inch (16-mm) cover on outside face.
- B. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:
1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M, with ASTM A 153/A 153M, Class B-2 coating.
 2. Stainless-Steel Wire: ASTM A 580/A 580M, Type 304.
 3. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, with ASTM A 153/A 153M, Class B coating.
 4. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304.
 5. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- C. Adjustable Anchors for Connecting to Structural Steel Framing: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch- (6.35-mm-) diameter, hot-dip galvanized steel wire.
 2. Tie Section: Triangular-shaped wire tie made from 0.187-inch- (4.76-mm-) diameter, hot-dip galvanized steel wire.
- D. Adjustable Anchors for Connecting to CMUs: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
1. Connector Section: Dovetail tabs for inserting into dovetail slots in concrete and attached to tie section; formed from 0.105-inch- (2.66-mm-) thick steel sheet, galvanized after fabrication.
 2. Tie Section: Triangular-shaped wire tie made from 0.187-inch- (4.76-mm-) diameter, hot-dip galvanized steel wire.
- E. Partition Top Anchors: 0.105-inch- (2.66-mm-) thick metal plate with a 3/8-inch- (9.5-mm-) diameter metal rod 6 inches (152 mm) long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from steel, hot-dip galvanized after fabrication.
- F. Rigid Anchors: Fabricate from steel bars 1-1/2 inches (38 mm) wide by 1/4 inch (6.35 mm) thick by 24 inches (610 mm) long, with ends turned up 2 inches (51 mm) or with cross pins unless otherwise indicated.

1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A 153/A 153M, or epoxy coating 0.020 inch (0.51 mm) thick.

2.9 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene.
- B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
- C. Bond-Breaker Strips: Asphalt-saturated felt complying with ASTM D 226/D 226M, Type I (No. 15 asphalt felt).

2.10 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated. Do not combine different air-entraining agents in mortar.
 1. Do not use calcium chloride in mortar or grout.
 2. Use portland cement-lime mortar unless otherwise indicated.
 3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.
 1. For masonry below grade or in contact with earth, use Type V sulfate-resisting cement.
 2. For reinforced masonry, use Type N.
 3. For exterior, above-grade, load-bearing and nonload-bearing walls and parapet walls; for interior load-bearing walls; for interior nonload-bearing partitions; and for other applications where another type is not indicated, use Type N.
- D. Grout for Unit Masonry: Comply with ASTM C 476.
 1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with TMS 602/ACI 530.1/ASCE 6 for dimensions of grout spaces and pour height.

2. Proportion grout in accordance with ASTM C 476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 3000 psi.
3. Provide grout with a slump of 8 to 11 inches (200 to 280 mm) as measured according to ASTM C 143/C 143M.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
 2. Verify that foundations are within tolerances specified.
 3. Verify that reinforcing dowels are properly placed.
 4. Verify that substrates are free of substances that would impair mortar bond.
- B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Build chases and recesses to accommodate items specified in this and other Sections.
- B. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match construction immediately adjacent to opening.
- C. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

3.3 TOLERANCES

- A. Dimensions and Locations of Elements:
 1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch (12 mm) or minus 1/4 inch (6 mm).
 2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch (12 mm).

3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch (6 mm) in a story height or 1/2 inch (12 mm) total.

B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet (6 mm in 3 m), or 1/2-inch (12-mm) maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2-inch (12-mm) maximum.
3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2-inch (12-mm) maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2-inch (12-mm) maximum.
5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2-inch (12-mm) maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), or 1/2-inch (12-mm) maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch (1.5 mm).

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm), with a maximum thickness limited to 1/2 inch (12 mm).
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch (3 mm).
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch (9 mm) or minus 1/4 inch (6 mm).
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm).

3.4 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less-than-nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.

- C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4 inches (100 mm). Bond and interlock each course of each wythe at corners. Do not use units with less-than-nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.
- D. Stopping and Resuming Work: Stop work by stepping back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.
- E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- F. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.
- G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below, and rod mortar or grout into core.
- H. Fill cores in hollow CMUs with grout 24 inches (600 mm) under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.
- I. Build nonload-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.
 - 1. Install compressible filler in joint between top of partition and underside of structure above.
 - 2. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide 1/2-inch (13-mm) clearance between end of anchor rod and end of tube. Space anchors 48 inches (1200 mm) o.c. unless otherwise indicated.
 - 3. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Section 078443 "Joint Firestopping."

3.5 MORTAR BEDDING AND JOINTING

- A. Lay hollow CMUs as follows:
 - 1. Bed face shells in mortar and make head joints of depth equal to bed joints.
 - 2. Bed webs in mortar in all courses of piers, columns, and pilasters.
 - 3. Bed webs in mortar in grouted masonry, including starting course on footings.
 - 4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.
- B. Lay solid CMUs with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

- D. Cut joints flush where indicated to receive waterproofing unless otherwise indicated.
- E. For masonry walls to receive fluid-applied air barriers, fill mortar joints fully and cut flush with face of masonry units. Provide masonry surfaces that are smooth and free from projections.
 - 1. Fill voids and holes, including those at mortar joints, with lean mortar mix or non-shrink grout, or provide smooth-troweled parge coat over entire surface of masonry.
 - a. For parging, use a steel-trowel finish to produce a smooth, flat, dense surface with a maximum surface variation of 1/8 inch per foot (3 mm per 300 mm).
 - b. Damp-cure parging for at least 24 hours and protect parging until cured.

3.6 MASONRY-JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch (16 mm) on exterior side of walls, 1/2 inch (13 mm) elsewhere. Lap reinforcement a minimum of 6 inches (150 mm).
 - 1. Space reinforcement not more than 16 inches (406 mm) o.c.
 - 2. Space reinforcement not more than 8 inches (203 mm) o.c. in foundation walls and parapet walls.
 - 3. Provide reinforcement not more than 8 inches (203 mm) above and below wall openings and extending 12 inches (305 mm) beyond openings in addition to continuous reinforcement.
- B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.
- C. Provide continuity at wall intersections by using prefabricated T-shaped units.
- D. Provide continuity at corners by using prefabricated L-shaped units.
- E. Cut and bend reinforcing units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.7 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

- A. Anchor masonry to structural steel and concrete, where masonry abuts or faces structural steel or concrete, to comply with the following:
 - 1. Provide an open space not less than 1 inch (25 mm) wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
 - 2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
 - 3. Space anchors as indicated, but not more than 24 inches (610 mm) o.c. vertically and 36 inches (915 mm) o.c. horizontally.

3.8 CONTROL JOINTS

- A. General: Install control-joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.
- B. Form control joints in concrete masonry by installing preformed control-joint gaskets designed to fit standard sash block.

3.9 LINTELS

- A. Provide concrete or masonry lintels where shown and where openings of more than 12 inches (305 mm) for brick-size units and 24 inches (610 mm) for block-size units are shown without structural steel or other supporting lintels.
- B. Provide minimum bearing of 8 inches (200 mm) at each jamb unless otherwise indicated.

3.10 REINFORCED UNIT MASONRY INSTALLATION

- A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
 - 1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
 - 2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements in TMS 602/ACI 530.1/ASCE 6.
- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
 - 1. Comply with requirements in TMS 602/ACI 530.1/ASCE 6 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
 - 2. Limit height of vertical grout pours to not more than 60 inches (1520 mm).

3.11 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.
- B. Inspections: Special inspections according to Level B in TMS 402/ACI 530/ASCE 5.
 - 1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.

2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
 3. Place grout only after inspectors have verified proportions of site-prepared grout.
- C. Testing Prior to Construction: One set of tests.
 - D. Testing Frequency: One set of tests for each 5000 sq. ft. (464 sq. m) of wall area or portion thereof.
 - E. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.
 - F. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.
 - G. Mortar Test (Property Specification): For each mix provided, according to ASTM C 780. Test mortar for mortar air content and compressive strength.
 - H. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.
 - I. Prism Test: For each type of construction provided, according to ASTM C 1314 at 7 days and at 28 days.

3.12 REPAIRING, POINTING, AND CLEANING

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

END OF SECTION

SECTION 044315 - ANCHORED STONE MASONRY VENEER

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Stone masonry anchored to unit masonry backup.
2. Stone masonry anchored to cold-formed metal framing and sheathing.
3. Thermal masonry support brackets for shelf angles.

B. Related Requirements:

1. Section 040101 "Repair and Cleaning of Existing Masonry for repairing and repointing existing stone masonry.
2. Section 055000 "Metal Fabrications" for furnishing steel lintels and shelf angles for stone veneer.
3. Section 076200 "Sheet Metal Flashing and Trim" for exposed sheet metal flashing.

1.2 PREINSTALLATION MEETINGS

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

1.3 ACTION SUBMITTALS

- ##### A. Sustainable Design Submittals: Provide Sustainable Design Submittals in Accordance with Section 018113.

1. Building Product Disclosure Requirements: To encourage the use of building products that are working to minimize their environmental and health impacts, provide the following information when available:

- a. Environmental Product Declaration: Submit with Product-specific Type III or Industry-wide Type III Environmental Product Declaration (EPD).

2. Recycled Content: The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.
3. Regional Materials: Materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles (160 km) of Project Site. If only a fraction of a product or material is extracted/harvested/recovered and manufactured locally, then only that percentage (by weight) shall contribute to the regional value.

- ##### B. Product Data: For each variety of stone, stone accessory, and manufactured product.

- ##### C. Samples for Initial Selection: For colored mortar and other items involving color selection.

- ##### D. Samples for Verification:

1. For each stone type indicated. Include at least five Samples in each set and show the full range of color and other visual characteristics in completed Work.
2. For each color of mortar required. Label Samples to indicate types and amounts of pigments used.

- ##### E. Shop Drawings: For the following:

1. Thermal Masonry Support Systems: Indicate component profiles, sizes, and configurations.
 - a. Show locations and details of anchors, connection attachments, size and type of fasteners, reinforcing, and accessories.
 - b. Indicate welded connections using standard welding symbols. Indicate net weld lengths.
- F. Design Data: For thermal masonry support systems. Submit manufacturer's design data and structural calculations, signed and sealed by qualified Professional Engineer.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and for professional engineer.
- B. Welding certificates.
- C. Qualification Data: For Installer.
- D. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, supply sources, and other information as required to identify materials used. Include mix proportions for mortar and source of aggregates.
 1. Neither receipt of list nor approval of mockups constitutes approval of deviations from the Contract Documents contained in mockups unless Architect approves such deviations in writing.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs experienced stonemasons and stone fitters.
- B. Designer Qualifications: Professional Engineer experienced in design of assemblies similar to that required for this Project and licensed in the State in which the Project is located.
- C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."
- D. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for materials and execution.
 1. Build mockup of typical wall area as part of comprehensive mockup specified in Section 014440 "Exterior Wall Mockup."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- B. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- C. Deliver preblended, dry mortar mix in moisture-resistant containers designed for use with dispensing silos. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, in a dry location, or in covered weatherproof dispensing silos.
- D. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.7 FIELD CONDITIONS

- A. Protection of Stone Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed stone masonry when construction is not in progress.
 - 1. Extend cover a minimum of 24 inches (600 mm) down both sides and hold cover securely in place.
- B. Stain Prevention: Immediately remove mortar and soil to prevent them from staining stone masonry face.
 - 1. Protect base of walls from rain-splashed mud and mortar splatter using coverings spread on the ground and over the wall surface.
 - 2. Protect sills, ledges, and projections from mortar droppings.
 - 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 - 4. Turn scaffold boards near the wall on edge at end of each day to prevent rain from splashing mortar and dirt on completed stone masonry.
- C. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace stone masonry damaged by frost or freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
 - 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and above and will remain so until masonry has dried, but not less than seven days after completing cleaning.
- D. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

1.8 COORDINATION

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

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations for Stone: Obtain stone from single quarry with resources to provide materials of consistent quality in appearance and physical properties.
- B. Source Limitations for Mortar Materials: Obtain mortar ingredients of uniform quality for each cementitious component from single manufacturer and each aggregate from single source or producer.

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Division 01 Section for "Quality Requirements," to design the thermal masonry support system.
- B. Structural Performance: Concealed thermal masonry support assembly shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Wind Loads: As indicated on Drawings.

- C. Seismic Performance: Concealed thermal masonry support assembly shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 - 1. Component Importance Factor: As indicated on Drawings.
- D. Limit deflection in each assembly caused by indicated loads and thermal movements, acting singly or in combination with one another, to not more than 1/600 of assembly's clear span or the following, whichever is smaller:
 - 1. 1/16 inch (1.5 mm), measured in plane of wall.
 - 2. 1/4 inch (6 mm), measured perpendicular to wall.
- E. Corrosion and Staining Control: Prevent galvanic and other forms of corrosion as well as staining by isolating metals and other materials from direct contact with incompatible materials. Materials shall not stain exposed surfaces of masonry and joint materials.

2.3 GRANITE SCHIST STONE

- A. General: Use Granite stone salvaged from existing construction at locations as directed by Architect. For Alternate Bid, provide new materials matching existing in type, color range, texture, size and other appearance characteristics, and complying with the following:
 - 1. Basis-of-Design Variety and Source: Subject to compliance with requirements, provide Granite Schist stone from Delaware Quarries, Inc. or an approved comparable product.
 - a. Contact: Dave Sullivan (dsullivan@delawarequarries.com, 215-297-8134 (office), 267-246-3653 (cell)).

2.4 MORTAR MATERIALS

- A. Portland Cement: ASTM C 150, Type I or Type II, except Type III may be used for cold-weather construction; natural color or white cement may be used as required to produce mortar color indicated.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Colored Portland Cement-Lime Mix: Packaged blend of portland cement, hydrated lime, and mortar pigments. Mix shall produce color indicated or, if not indicated, as selected from manufacturer's standard colors. Pigments shall not exceed 10 percent of portland cement by weight.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Holcim (US) Inc.; Rainbow Mortamix Custom Color Cement/Lime.
 - b. Lafarge North America Inc.; Eaglebond.
 - c. Lehigh Cement Company; Lehigh Custom Color Portland/Lime Cement.
 - d. Mutual Materials Co.; DesignMix Colored Mortar Mix.
- D. Aggregate: ASTM C 144 and as follows:
 - 1. For pointing mortar, use aggregate graded with 100 percent passing No. 16 (1.18-mm) sieve.
- E. Water: Potable.

2.5 VENEER ANCHORS

- A. Materials:

1. Stainless-Steel Wire: ASTM A 580/A 580M, Type 304.
 2. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304.
- B. Size: Sufficient to extend at least halfway, but not less than 1-1/2 inches (38 mm), through stone masonry and with at least a 5/8-inch (16-mm) cover on exterior face.
- C. Adjustable, Screw-Attached, Masonry-Veneer Anchors: Wire tie and a rib-stiffened, sheet metal anchor section with screw holes top and bottom, with a projecting vertical tab having a slotted hole for inserting wire tie. Provide anchor manufacturer's wedge-shaped insulation washer to retain insulation at each anchor location.
1. Basis-of-Design Products: Subject to compliance with requirements, provide the following products by Hohmann & Barnard, Inc. (h-b.com):
 - a. Adjustable Anchor System: HVR-195VB
 - b. Wire Tie: Vee Byna-Tie.
 - c. Insulation Washer: Wedge-Lok.
 2. Expansion Bolt: For anchors attached to concrete or masonry, provide brass expansion bolt in center hole of backplate.
- D. Polymer-Coated, Steel Drill Screws for Steel Studs: ASTM C 954 except manufactured with hex washer head and neoprene washer, No. 10 (4.8-mm diameter) by length required to penetrate steel-stud flange with not less than three exposed threads, and with organic polymer coating with salt-spray resistance to red rust of more than 800 hours per ASTM B 117.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. ITW Buildex; Teks Maxiseal with Climaseal finish.
 - b. Textron Inc., Textron Fastening Systems; Elco Dril-Flex with Stalgard finish.
- E. Polymer-Coated, Steel Tapping Screws for Concrete Masonry: Self-tapping screws with specially designed threads for tapping and wedging into masonry, with hex washer head and neoprene washer, 3/16-inch (4.8-mm) diameter by 1-1/2-inch (38-mm) length, and with organic polymer coating with more than 800-hour, salt-spray resistance to red rust per ASTM B 117.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. ITW Buildex; Tapcon.
 - b. Powers Fasteners; Tapper.

2.6 EMBEDDED FLASHING MATERIALS

- A. Metal Flashing: Provide stainless-steel flashing where flashing is exposed or partly exposed and where indicated, complying with Section 076200 "Sheet Metal Flashing and Trim."
- B. Solder and Sealants for Sheet Metal Flashings: As specified in Section 076200 "Sheet Metal Flashing and Trim."

2.7 THERMAL BRACKET SYSTEMS

- A. Thermal Brackets for Shelf Angles: Engineered system to reduce thermal bridging in shelf or relief angle assemblies, allow for continuous insulation behind the support angle, and permit adjustments in multiple directions to accommodate construction tolerances.
 1. Products: Subject to compliance with requirements, provide one of the following:

- a. FERO Corporation; FERO FAST Thermal Bracket™.
 - b. Hohmann & Barnard, Inc. (h-b.com); TBS Thermal Brick Support System.
2. Thermal Masonry Veneer Support System: Fabricate components from Type 304 stainless steel.
- a. Bracket Depth: Dimension determined by structural calculations.
 - b. Bracket Length: Dimension determined by structural calculations.
 - c. Projected Leg Depth: Dimension determined by structural calculations.
3. Fasteners: Fabricate fasteners and anchors from stainless steel, ASTM A 240 or ASTM A 666, Type 304; temper as required to support loads imposed without exceeding allowable design stresses. Select fasteners of type, grade, and class required to produce connections suitable for anchoring masonry support system to other types of construction indicated and capable of withstanding design loads.
4. Fabrication: Fabricate components to comply with performance requirements with allowances for field adjustments.
5. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
6. Weld shop connections to comply with applicable provisions of AWS D1.1/D1.1M.

2.8 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene.
- B. Mesh Weep Holes/Vents: Free-draining mesh; made from polyethylene strands, full width of head joint and 2 inches (50 mm) high by thickness of stone masonry; in color selected from manufacturer's standard.
- 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. CavClear/Archovations, Inc.; CavClear Weep Vents.
 - b. Mortar Net USA, Ltd.; Mortar Net Weep Vents.
- C. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.
- 1. Basis-of-Design Product: Subject to compliance with requirements, provide Mortar Net USA, Ltd.; Mortar Net.
 - 2. Configuration: Strips, full depth of cavity and 10 inches (250 mm) wide, with dovetail-shaped notches 7 inches (175 mm) deep that prevent mesh from being clogged with mortar droppings.

2.9 MASONRY CLEANERS

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

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

2.10 FABRICATION

- A. General: Fabricate stone units in sizes and shapes required to comply with requirements indicated.
 - 1. For granite, comply with recommendations in NBGQA's "Specifications for Architectural Granite."
- B. Cut, split, or select stone to produce pieces of thickness, size, and shape indicated, including details on Drawings and pattern specified in "Setting Stone Masonry" Article.
 - 1. Shape stone specified to be laid in three-course, random range ashlar pattern with sawed beds.
- C. Dress joints (bed and vertical) straight and at right angle to face unless otherwise indicated. Shape beds to fit supports.
- D. Cut and drill sinkages and holes in stone for anchors and supports.
- E. Carefully inspect stone at quarry or fabrication plant for compliance with requirements for appearance, material, and fabrication. Replace defective units before shipment.
 - 1. Clean sawed backs of stone to remove rust stains and iron particles.
- F. Thickness of Stone: Provide thickness indicated, but not less than the following:
 - 1. Thickness: Approximately 4 inches (100 mm) plus or minus 1/2 inch (13 mm).
- G. Shape stone for type of masonry (pattern) to approximate pattern of existing stone masonry, as follows:
 - 1. Strip ashlar with random lengths, random end profile, and random course heights (random rise/interrupted course).
- H. Finish exposed stone faces and edges to comply with requirements indicated for finish and to match approved samples and mockups.
 - 1. Finish for New Replacement Stone: Mixed split face and seam face, with not less than 30 percent seam face.
 - 2. Finish for Modified Salvaged Stone: Maintain existing exposed face. Cut faces may be used for conditions that will be concealed from view in the completed Work.

2.11 MORTAR MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
 - 1. Do not use calcium chloride.
 - 2. Use portland cement-lime unless otherwise indicated. Do not use masonry cement or mortar cement mortar.
 - 3. Mixing Pointing Mortar: Thoroughly mix cementitious and aggregate materials together before adding water. Then mix again, adding only enough water to produce a damp, unworkable mix that will retain its form when pressed into a ball. Maintain mortar in this dampened condition for one to two hours. Add remaining water in small portions until mortar reaches required consistency. Use mortar within 30 minutes of final mixing; do not retemper or use partially hardened material.

- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in the form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Stone Masonry: Comply with ASTM C 270, Proportion Specification.
 - 1. Mortar for Setting Stone: Type S.
 - 2. Mortar for Pointing Stone: Type N or Type O.
- D. Pigmented Mortar: Use colored cement product.
 - 1. Pigments shall not exceed 10 percent of portland cement by weight.
 - 2. Mix to match approved sample.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces indicated to receive stone masonry, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of stone masonry.
- B. Examine substrate to verify that dovetail slots, inserts, reinforcement, veneer anchors, flashing, and other items installed in substrates and required for or extending into stone masonry are correctly installed.
- C. Examine wall framing, sheathing, and air barriers to verify that stud locations are suitable for spacing of veneer anchors and that installation will result in a weatherproof covering.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Accurately mark stud centerlines on face of air barrier before beginning stone installation.
- B. Clean dirty or stained stone surfaces by removing soil, stains, and foreign materials before setting. Clean stone by thoroughly scrubbing with fiber brushes and then drenching with clear water. Use only mild cleaning compounds that contain no caustic or harsh materials or abrasives.

3.3 SETTING STONE MASONRY

- A. Perform necessary field cutting and trimming as stone is set.
 - 1. Use power saws to cut stone that is fabricated with saw-cut surfaces. Cut lines straight and true, with edges eased slightly to prevent snipping.
 - 2. Use hammer and chisel to split stone that is fabricated with split surfaces. Make edges straight and true, matching similar surfaces that were shop or quarry fabricated.
- B. Sort stone before it is placed in wall to remove stone that does not comply with requirements relating to aesthetic effects, physical properties, or fabrication, or that is otherwise unsuitable for intended use.
- C. Arrange stones in pattern with course heights as indicated, random lengths, and uniform joint widths, with offset between vertical joints as indicated.
- D. Arrange stones with color and size variations uniformly dispersed for an evenly blended appearance.

- E. Set stone to comply with requirements indicated on Drawings. Install supports, fasteners, and other attachments indicated or necessary to secure stone masonry in place. Set stone accurately in locations indicated with edges and faces aligned according to established relationships and indicated tolerances.
- F. Maintain uniform joint widths except for variations due to different stone sizes and where minor variations are required to maintain bond alignment if any. Lay walls with joints not less than 1/4 inch (6 mm) at narrowest points or more than 3/8 inch (10 mm) at widest points.
- G. Provide sealant joints of widths and at locations indicated.
 - 1. Keep sealant joints free of mortar and other rigid materials.
 - 2. Sealing joints is specified in Section 079200 "Joint Sealants."
- H. Install embedded flashing and weep holes at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.
 - 1. At stud-framed walls, extend flashing through stone masonry, up sheathing face at least 16 inches (400 mm), and behind air barrier.
 - 2. At lintels and shelf angles, extend flashing full length of angles but not less than 6 inches (150 mm) into masonry at each end.
 - 3. At sills, extend flashing not less than 4 inches (100 mm) at ends.
 - 4. At ends of head and sill flashing, turn up not less than 2 inches (50 mm) to form end dams.
 - 5. Interlock end joints of ribbed sheet metal flashing by overlapping ribs not less than 1-1/2 inches (38 mm) or as recommended by flashing manufacturer, and seal lap with elastomeric sealant complying with requirements in Section 079200 "Joint Sealants" for application indicated.
- I. Place weep holes and vents in joints where moisture may accumulate, including at base of cavity walls, above shelf angles, and at flashing.
 - 1. Use mesh weep holes/vents or open head joints to form weep holes.
 - 2. Space weep holes 16 inches (400 mm) o.c. unless otherwise indicated.
 - 3. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in "Miscellaneous Masonry Accessories" Article.
- J. Install vents in head joints at top of each continuous cavity at spacing indicated. Use mesh weep holes/vents to form vents.
 - 1. Close cavities off vertically and horizontally with blocking in manner indicated. Install through-wall flashing and weep holes above horizontal blocking.

3.4 CONSTRUCTION TOLERANCES

- A. Variation from Plumb: For vertical lines and surfaces, do not exceed 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (10 mm in 6 m), or 1/2 inch in 40 feet (13 mm in 12 m) or more. For external corners, expansion joints, control joints, and other conspicuous lines, do not exceed 1/4 inch in 20 feet (6 mm in 6 m) or 1/2 inch in 40 feet (13 mm in 12 m) or more.
- B. Variation from Level: For bed joints and lines of exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines, do not exceed 1/4 inch in 20 feet (6 mm in 6 m) or 1/2 inch in 40 feet (13 mm in 12 m) or more.
 - 1. For thermal masonry support systems, do not vary from level by more than 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.
- C. Variation of Linear Building Line: For position shown in plan, do not exceed 1/2 inch in 20 feet (13 mm in 6 m) or 3/4 inch in 40 feet (19 mm in 12 m) or more.

- D. Measure variation from level, plumb, and position shown in plan as a variation of the average plane of each stone face from level, plumb, or dimensioned plane.
- E. Variation in Mortar-Joint Thickness: Do not vary from joint size range indicated.
- F. Variation in Plane between Adjacent Stones: Do not exceed one-half of tolerance specified for thickness of stone.

3.5 INSTALLATION OF ANCHORED STONE MASONRY

- A. Anchor stone masonry to concrete with corrugated-metal veneer anchors unless otherwise indicated. Secure anchors by inserting dovetailed ends into dovetail slots in concrete.
- B. Anchor stone masonry to unit masonry with adjustable, screw-attached veneer anchors unless otherwise indicated. Fasten anchors to unit masonry with two screws.
- C. Anchor stone masonry to stud framing with adjustable, screw-attached veneer anchors unless otherwise indicated. Fasten anchors through sheathing to framing with two screws.
- D. Embed veneer anchors in mortar joints of stone masonry at least halfway, but not less than 1-1/2 inches (38 mm), through stone masonry and with at least a 5/8-inch (16-mm) cover on exterior face.
- E. Space anchors not more than 18 inches (450 mm) o.c. vertically and 32 inches (800 mm) o.c. horizontally, with not less than one anchor per 2.67 sq. ft. (0.25 sq. m) of wall area. Install additional anchors within 12 inches (300 mm) of openings, sealant joints, and perimeter at intervals not exceeding 12 inches (300 mm).
- F. Set stone in full bed of mortar with full head joints unless otherwise indicated. Build anchors into mortar joints as stone is set.
- G. Provide 2-inch (50-mm) cavity between stone masonry and backup construction unless otherwise indicated. Keep cavity free of mortar droppings and debris.
 - 1. Slope beds toward cavity to minimize mortar protrusions into cavity.
 - 2. Do not attempt to trowel or remove mortar fins protruding into cavity.
- H. Rake out joints for pointing with mortar to depth of not less than 3/4 inch (19 mm) before setting mortar has hardened. Rake joints to uniform depths with square bottoms and clean sides.

3.6 THERMAL MASONRY SUPPORT SYSTEM

- A. Install thermal masonry support system in accordance with manufacturer's written instructions and approved shop drawings.
- B. Provide anchorage devices and fasteners as indicated in approved shop drawings.
- C. Install components level, plumb, and true to line.
- D. 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. Finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

3.7 POINTING

- A. Prepare stone-joint surfaces for pointing with mortar by removing dust and mortar particles. Where setting mortar was removed to depths greater than surrounding areas, apply pointing mortar in layers not more than 3/8 inch (10 mm) deep until a uniform depth is formed.
- B. Point stone joints by placing and compacting pointing mortar in layers of not more than 3/8 inch (10 mm) deep. Compact each layer thoroughly and allow to it become thumbprint hard before applying next layer.
- C. Tool joints, when pointing mortar is thumbprint hard, with a smooth jointing tool to produce the following joint profile:
 - 1. Joint Profile: To approximate joint profile in existing building exterior stone masonry.

3.8 ADJUSTING AND CLEANING

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

END OF SECTION

SECTION 044316 - ADHERED STONE MASONRY VENEER

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Stone masonry adhered to metal lath and plywood sheathing over metal framing for interior applications, using stone material salvaged from existing construction.

1.2 ACTION SUBMITTALS

- A. Sustainable Design Submittals: Provide Sustainable Design Submittals in Accordance with Section 018113.
 - 1. Building Product Disclosure Requirements: To encourage the use of building products that are working to minimize their environmental and health impacts, provide the following information when available:
 - a. Environmental Product Declaration: Submit with Product-specific Type III or Industry-wide Type III Environmental Product Declaration (EPD).
 - 2. Recycled Content: The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.
 - 3. Regional Materials: Materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles (160 km) of Project Site. If only a fraction of a product or material is extracted/harvested/recovered and manufactured locally, then only that percentage (by weight) shall contribute to the regional value.
- B. Product Data: For variety of stone and for each stone accessory and manufactured product.
- C. Samples for Initial Selection: For colored mortar and other items involving color selection.
- D. Samples for Verification:
 - 1. For modified (cut down) salvaged stone and for new replacement stone to match existing. Include at least five Samples in each set and show the full range of color and other visual characteristics in completed Work.
 - 2. For each color of mortar required. Label Samples to indicate types and amounts of pigments used.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, supply sources, and other information as required to identify materials used. Include mix proportions for mortar and source of aggregates.
 - 1. Neither receipt of list nor approval of mockups constitutes approval of deviations from the Contract Documents contained in mockups unless Architect approves such deviations in writing.

- C. Stone Test Reports: For stone variety proposed for use on Project, by a qualified testing agency, indicating compliance with required physical properties, other than abrasion resistance, according to referenced ASTM standards. Base reports on testing done within previous three years.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs experienced stonemasons and stone fitters.
- B. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for materials and execution.
 - 1. Freestanding Mockup: Build mockup for typical interior wall apart from the construction in size approximately 72 inches long by 48 inches high by full thickness, including backup construction and accessories. Include multiple mortar samples within mockup as directed by Architect for selection of mortar characteristics.
 - 2. In-Place Mockup: After approval of freestanding mockup, build mockup for typical interior wall as part of permanent construction in size approximately 72 inches long by 48 inches high by full thickness, including backup construction and accessories.
 - 3. Include metal studs, plywood sheathing, and metal lath in the in-place mockup.
 - 4. Include metal angle trim as detailed on Drawings in the in-place mockup.
 - 5. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 6. Approved in-place mockup may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- B. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- C. Deliver preblended, dry mortar mix in moisture-resistant containers designed for use with dispensing silos. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, in a dry location, or in covered weatherproof dispensing silos.

1.6 FIELD CONDITIONS

- A. Stain Prevention: Immediately remove mortar and soil to prevent them from staining stone masonry face.
 - 1. Protect sills, ledges, and projections from mortar droppings.
 - 2. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations for Stone: Obtain stone from single quarry with resources to provide materials of consistent quality in appearance and physical properties.

- B. Source Limitations for Mortar Materials: Obtain mortar ingredients of uniform quality for each cementitious component from single manufacturer and each aggregate from single source or producer.

2.2 GRANITE SCHIST STONE

- A. General: Use Granite stone salvaged from existing construction at locations as directed by Architect. For Alternate Bid, provide new materials matching existing in type, color range, texture, size and other appearance characteristics, and complying with the following:

- 1. Basis-of-Design Variety and Source: Subject to compliance with requirements, provide Granite Schist stone from Delaware Quarries, Inc. or an approved comparable product.
Contact: Dave Sullivan (dsullivan@delawarequarries.com, 215-297-8134 (office), 267-246-3653 (cell).

2.3 MORTAR MATERIALS

- A. Portland Cement: ASTM C 150, Type I or Type II, except Type III may be used for cold-weather construction; natural color or white cement may be used as required to produce mortar color indicated.

- B. Hydrated Lime: ASTM C 207, Type S.

- C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.

- 1. Products: Subject to compliance with requirements, provide one of the following:
Essroc, Italcementi Group; Saylor's Plus.
Holcim (US) Inc.; Rainbow Mortamix Custom Color Cement/Lime.
Lafarge North America Inc.; Eaglebond.
Lehigh Cement Company; Lehigh Custom Color Portland/Lime Cement.
Mutual Materials Co.; DesignMix Mortar Mix.

- D. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C 979. Use only pigments with a record of satisfactory performance in stone masonry mortar.

- 1. Products: Subject to compliance with requirements, provide one of the following:
Davis Colors; True Tone Mortar Colors.
Lanxess Corporation; Bayferrox Iron Oxide Pigments.
Solomon Colors; SGS Mortar Colors.

- E. Colored Portland Cement-Lime Mix: Packaged blend of portland cement, hydrated lime, and mortar pigments. Mix shall produce color indicated or, if not indicated, as selected from manufacturer's standard colors. Pigments shall not exceed 10 percent of portland cement by weight.

- 1. Products: Subject to compliance with requirements, provide one of the following:
Holcim (US) Inc.; Rainbow Mortamix Custom Color Cement/Lime.
Lafarge North America Inc.; Eaglebond.
Lehigh Cement Company; Lehigh Custom Color Portland/Lime Cement.
Mutual Materials Co.; DesignMix Colored Mortar Mix.

- F. Aggregate: ASTM C 144 and as follows:

- 1. For pointing mortar, use aggregate graded with 100 percent passing No. 16 (1.18-mm) sieve.

2. Colored Aggregates: Natural-colored sand or ground marble, granite, or other sound stone; of color necessary to produce required mortar color.
- G. Latex Additive: Manufacturer's standard acrylic-resin or styrene-butadiene-rubber water emulsion, serving as replacement for part or all of gaging water, of type specifically recommended by latex-additive manufacturer for use with field-mixed portland cement mortar bed, and not containing a retarder.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
Custom Building Products.
Laticrete International, Inc.
MAPEI Corporation.
- H. Water: Potable.

2.4 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene.
- B. Expanded Metal Lath: 3.4 lb/sq. yd. (1.8 kg/sq. m), self-furring, diamond-mesh lath complying with ASTM C 847. Fabricate from structural-quality, zinc-coated (galvanized) steel sheet complying with ASTM A 653/A 653M, G60 (Z180).
- C. Lath Attachment Devices: Material and type required by ASTM C 1063 for installations indicated.

2.5 MASONRY CLEANERS

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

2.6 FABRICATION

- A. General: Fabricate stone units in sizes and shapes required to comply with requirements indicated, including slicing units to produce stone veneer thickness indicated.
 1. Cut salvaged stone materials to required thickness for stone masonry veneer, retaining exposed faces intact.
- B. Select stone to produce pieces of thickness, size, and shape indicated, including details on Drawings.

- C. Dress joints (bed and vertical) to approximate appearance of existing exterior stone masonry at existing building.
- D. Carefully inspect stone for compliance with requirements for appearance, material, and fabrication. Replace defective units.
 - 1. Clean sawed backs of stone to remove rust stains and iron particles.
- E. Gage backs of stones for adhered veneer if more than 81 sq. in. (522 sq. cm) in area.
- F. Thickness of Stone: Provide thickness indicated, but not less than the following:
 - 1. Thickness: Approximately 1-1/2 inch.
- G. Shape stone for type of masonry (pattern) to approximate pattern of existing stone masonry, as follows:
 - 1. Strip ashlar with random lengths, random end profile, and random course heights (random rise/interrupted course).
- H. Finish exposed stone faces and edges to comply with requirements indicated for finish and to match approved samples and mockups.
 - 1. Finish for New Replacement Stone: Mixed split face and seam face, with not less than 30 percent seam face.
 - 2. Finish for Modified Salvaged Stone: Maintain existing exposed face. Cut faces may be used for conditions that will be concealed from view in the completed Work.

2.7 MORTAR MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
 - 1. Do not use calcium chloride.
 - 2. Use portland cement-lime mortar unless otherwise indicated.
 - 3. Mixing Pointing Mortar: Thoroughly mix cementitious and aggregate materials together before adding water. Then mix again, adding only enough water to produce a damp, unworkable mix that will retain its form when pressed into a ball. Maintain mortar in this dampened condition for one to two hours. Add remaining water in small portions until mortar reaches required consistency. Use mortar within 30 minutes of final mixing; do not retemper or use partially hardened material.
- B. Exposed Mortar: Use packaged mix or site-blended mix complying with requirements in this Section, as directed by Architect to produce colors, textures and other characteristics required. Select and proportion pigments or aggregates with other ingredients to produce mixes matching samples approved by Architect.
 - 1. Pigmented Mortar: Use colored cement product or select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products. Pigments shall not exceed 10 percent of portland cement by weight.
 - 2. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates and natural color or white cement as necessary to produce required mortar color.

- C. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in the form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- D. Cement-Paste Bond Coat: Mix either neat cement and water or cement, sand, and water to a consistency similar to that of thick cream.
 - 1. For latex-modified, portland cement, setting-bed mortar, substitute latex admixture for part or all of water, according to latex-additive manufacturer's written instructions.
- E. Mortar for Scratch Coat over Metal Lath: 1-part portland cement, 1/2 part lime, 5 parts loose damp sand, and enough water to produce a workable consistency.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

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

3.3 SETTING OF STONE MASONRY, GENERAL

- A. Perform necessary field cutting and trimming as stone is set.
 - 1. Use power saws to cut stone that is fabricated with saw-cut surfaces. Cut lines straight and true, with edges eased slightly to prevent snipping.
 - 2. Use hammer and chisel to split stone that is fabricated with split surfaces. Make edges straight and true, matching similar surfaces that were shop or quarry fabricated.
 - 3. Pitch face at field-split edges as needed to match stones that are not field split.
- B. Sort stone before it is placed in wall to remove stone that does not comply with requirements relating to aesthetic effects, physical properties, or fabrication, or that is otherwise unsuitable for intended use.
- C. Arrange stones in strip ashlar with random lengths, random end profile, and random course heights (random rise/interrupted course) to approximate pattern of existing building exterior stone masonry.
- D. Arrange stones with color and size variations uniformly dispersed for an evenly blended appearance.
- E. Set stone to comply with requirements indicated on Drawings. Install supports, fasteners, and other attachments indicated or necessary to secure stone masonry in place. Set stone accurately in locations indicated with edges and faces aligned according to established relationships and indicated tolerances.
- F. Maintain uniform joint widths except for variations due to different stone sizes and where minor variations are required to maintain bond alignment if any. Lay walls with joints not less than 3/8 inch (10 mm) at narrowest points or more than 5/8 inch (16 mm) at widest points.

- G. Provide sealant joints of widths and at locations indicated.
 - 1. Keep sealant joints free of mortar and other rigid materials.
 - 2. Sealing joints is specified in Section 079200 "Joint Sealants."

3.4 CONSTRUCTION TOLERANCES

- A. Variation from Plumb: For vertical lines and surfaces, do not exceed 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (10 mm in 6 m), or 1/2 inch in 40 feet (13 mm in 12 m) or more. For external corners, expansion joints, control joints, and other conspicuous lines, do not exceed 1/4 inch in 20 feet (6 mm in 6 m) or 1/2 inch in 40 feet (13 mm in 12 m) or more.
- B. Variation from Level: For bed joints and lines of exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines, do not exceed 1/4 inch in 20 feet (6 mm in 6 m) or 1/2 inch in 40 feet (13 mm in 12 m) or more.
- C. Variation of Linear Building Line: For position shown in plan, do not exceed 1/2 inch in 20 feet (13 mm in 6 m) or 3/4 inch in 40 feet (19 mm in 12 m) or more.
- D. Measure variation from level, plumb, and position shown in plan as a variation of the average plane of each stone face from level, plumb, or dimensioned plane.
- E. Variation in Mortar-Joint Thickness: Do not vary from joint size range indicated.
- F. Variation in Plane between Adjacent Stones: Do not exceed one-half of tolerance specified for thickness of stone.

3.5 INSTALLATION OF ADHERED STONE MASONRY VENEER

- A. Install lath by fastening through sheathing into framing to comply with ASTM C 1063.
- B. Install scratch coat over metal lath 3/8 inch (10 mm) thick to comply with ASTM C 926.
- C. Coat backs of stone units and face of scratch coat with cement-paste bond coat, then butter both surfaces with setting mortar. Use sufficient setting mortar so a slight excess will be forced out the edges of stone units as they are set. Tap units into place, completely filling space between units and scratch coat.
- D. Rake out joints for pointing with mortar to depth of not less than 3/4 inch (19 mm) before setting mortar has hardened. Rake joints to uniform depths with square bottoms and clean sides.

3.6 POINTING

- A. Prepare stone-joint surfaces for pointing with mortar by removing dust and mortar particles. Where setting mortar was removed to depths greater than surrounding areas, apply pointing mortar in layers not more than 3/8 inch (10 mm) deep until a uniform depth is formed.
- B. Point stone joints by placing and compacting pointing mortar in layers of not more than 3/8 inch (10 mm) deep. Compact each layer thoroughly and allow it to become thumbprint hard before applying next layer.
- C. Tool joints, when pointing mortar is thumbprint hard, with a smooth jointing tool to produce the following joint profile:

1. Joint Profile: Flush, to approximate joint profile in existing building exterior stone masonry.

3.7 ADJUSTING AND CLEANING

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

END OF SECTION

SECTION 047200 - CAST STONE MASONRY

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes, but are not limited to, the following:
 - 1. Window lintels and sills.
 - 2. Water table bands
 - 3. Vertical and horizontal wall profiles of size and shape indicated on the drawings
 - 4. Non-staining setting mortar and joint sealant
 - 5. Accessories to complete the work
 - 6. Connection details

- B. Related Sections include the following:
 - 1. Section 017419 "Construction Waste Management and Disposal."
 - 2. Section 018113 "Sustainable Design Requirements."
 - 3. Section 042200 "Concrete Unit Masonry."
 - 4. Section 071900 "Water Repellants" for graffiti control coatings on Masonry

1.2 SUBMITTALS

- A. Sustainable Design Submittals: Provide Sustainable Design Submittals in Accordance with Section 018113.
 - 1. Building Product Disclosure Requirements: To encourage the use of building products that are working to minimize their environmental and health impacts, provide the following information when available:
 - a. Environmental Product Declaration: Submit with Product-specific Type III or Industry-wide Type III Environmental Product Declaration (EPD).
 - 2. Recycled Content: The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.
 - 3. Regional Materials: Materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles (160 km) of Project Site. If only a fraction of a product or material is extracted/harvested/recovered and manufactured locally, then only that percentage (by weight) shall contribute to the regional value.

- B. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for cast stone units.

- C. Shop Drawings: Show fabrication and installation details for cast stone units. Include dimensions; details of reinforcement and anchorages, if any; and indication of finished faces.
 - 1. Include building elevations showing layout of units and locations of joints and anchors.

- D. Samples: For each color and texture of cast stone required, 10 inches (250 mm) square in size.

- E. Samples for Initial Selection: For colored mortar, showing the full range of colors available.
- F. Samples for Verification: For each mortar color required, showing the full range expected in the finished construction. Make samples using the same sand and mortar ingredients to be used on Project. Label samples to indicate type and amount of colorant used.
- G. Full-Size Samples: For each type of cast stone unit required. Make available for Architect's review at Project site before installing cast stone.
 - 1. Approved Samples may be installed in the Work.
- H. 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. Include copies of material test reports for completed projects, indicating compliance of cast stone with ASTM C 1364.
- I. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of cast stone with requirements indicated.

1.3 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm experienced in manufacturing cast stone units similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to manufacture required units.
- B. Testing Agency Qualifications: An independent testing agency qualified according to ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.
- C. Source Limitations for Cast Stone: Obtain cast stone units through one source from a single manufacturer.
- D. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color, from one manufacturer for each cementitious component and from one source or producer for each aggregate.
- E. Casting Tolerances: Maintain casting, bowing, warping and dimension tolerance within the following maximums:
 - 1. Overall dimension for height and width of units
 - a. Plus zero of unit dimension to minus 3/32" for 10'-0" and over.
 - 2. Twist, Bowing or Warping
 - a. Do not exceed length/360 or 1/8", whichever is greater.
 - 3. Insert Locations
 - a. Place within plus or minus 1/8" in each direction.

4. Length of units shall not deviate by more than +/- 1/8" from approved dimensions.

1.4 QUALITY CONTROL

- A. Engineering: Provide the services of 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, to design and certify that the work of this section meets or exceeds the performance requirements specified in this section. The engineer shall assume professional responsibility for cast stone and connection design and safety, including miscellaneous supporting steel framework. Design decisions and modifications that affect visual characteristics shall be subject to approval by Architect. Engineer shall coordinate work with building Structural Engineer to obtain restrictions on attachment locations and loadings.
- B. Design: Cast stone contractor shall design and detail all cast stone units and their connections to the structural frame in accordance with all applicable loadings specified in the applicable building code. Provide complete structural design calculations for all different types of units, indicating that the cast stone units can safely withstand stresses induced due to dead loads, wind loads, seismic loads, and temperature loads. The design of the units shall also take into account stresses induced due to shrinkage, fabrication, handling, and erection of the units. All calculations shall be prepared under the supervision of a registered professional engineer who will furnish certification stating that the cast stone units design provided by the Contractor, meet or exceed the requirements of the Contract Documents.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Pack, handle, and ship cast stone units in suitable packs or pallets.
 1. Lift with wide-belt slings; do not use wire rope or ropes that might cause staining. Move cast stone units, if required, using dollies with wood supports.
 2. Store cast stone units on wood skids or pallets with nonstaining, waterproof covers. Arrange to distribute weight evenly and to prevent damage to units. Ventilate under covers to prevent condensation.
- B. Store installation materials on elevated platforms, under cover, and in a dry location.
- C. Store mortar aggregates where grading and other required characteristics can be maintained and contamination avoided.

1.6 COORDINATION

- A. Coordinate production and delivery of cast stone with unit masonry work to minimize the need for on-site storage and to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, provide Architectural Cast Stone by Westbrook Concrete Block, Inc. Alternate manufacturers offering products that may be incorporated into the Work include the following:

1. Russell: W. N. Russell & Co.
2. Rock Cast
3. Continental Cast

2.2 CAST STONE MATERIALS

- A. All Cast Stone used in this work shall be manufactured by Westbrook Concrete Block, Inc. or approved equal and conform to the following properties:
1. Compressive Strength, ASTM C 1194: 6500 psi min. for products at 28 days.
 2. Absorption, ASTM C 1195 or ASTM C 642: 6% max. for products at 28 days.
 3. Cumulative Percent Weight Loss (CPWL) shall be less than 5% after 300 freeze/thaw cycles when tested in accordance with ASTM C 1364.
 4. Air Content: ASTM C 173 or C 231, for wet cast product only shall be 4-8%. Air entrainment is not required for dry cast products.
 5. Linear Shrinkage - ASTM C 426: Shrinkage shall not exceed 0.065%.
 6. Color Variation
 - a. Must match color and finish of approved sample when viewed in direct daylight at a 5 foot distance.
 - b. ASTM color variation allowed - 2% hue; 6% lightness, chrome and hue.
 - c. ASTM color variation allowed - 2% hue; 6% lightness, chrome and hue
- B. General: Comply with ASTM C 1364 and the following:
- C. Portland Cement: ASTM C 150, Type I, containing not more than 0.60 percent total alkali when tested according to ASTM C 114.
- D. Coarse Aggregates: Granite, quartz, or limestone complying with ASTM C 33; gradation as needed to produce required textures.
- E. Fine Aggregates: Manufactured or natural sands complying with ASTM C 33, gradation as needed to produce required textures.
- F. Air-Entraining Admixture: ASTM C 260, certified by the manufacturer to be compatible with other admixtures used.
1. Add to mixes for units exposed to the exterior at manufacturer's prescribed rate to result in an air content of 5 to 7 percent.
- G. Reinforcement: Deformed steel bars complying with ASTM A 615/A 615M.
1. Galvanized Coating: ASTM A 767/A 767M.
- H. Embedded Anchors and Other Inserts: Fabricated from stainless steel complying with ASTM A 276 or ASTM A 666, Type 304.
- I. Embedded Anchors and Other Inserts: Fabricated from steel complying with ASTM A 36/A 36M, and hot-dip galvanized to comply with ASTM A 123.

2.3 REINFORCEMENT

- A. Cast Stone shall be reinforced with new billet steel reinforcing bars meeting ASTM A 615, grade 40 or grade 60, when necessary for safe handling, setting and structural stress, and the size of the reinforcing shall be specified. If the surfaces are to be exposed to the weather, the reinforcement shall be galvanized when covered with less than 2 inches of material for bars larger than 5/8 in. and 1-1/2 in. for bars 5/8 in. or smaller. The material covering in all cases shall be at least twice the diameter of the bars.
- B. Cast Stone panels shall have a minimum thickness of 2-1/2 in. and shall be reinforced as required for handling, and to allow for temperature changes and structural stress. Steel reinforcement shall amount to a minimum of 1/4 percent of the sectional area of the panel. Should the panel be greater than 12 in. in any sectional dimension, the temperature steel shall be placed in both directions.
- C. Where applicable, cold-drawn steel wire reinforcement meeting ASTM A 82, welded wire fabric reinforcement meeting ASTM A 185 or ASTM A 497 or steel bar or rod mat reinforcement meeting ASTM A 184 may be used.

2.4 CAST STONE UNITS

- A. Provide cast stone units complying with ASTM C 1364.
 - 1. Provide units that are resistant to freezing and thawing as determined by laboratory testing according to ASTM C 666, Procedure A, as modified by ASTM C 1364.
- B. Reinforce units as indicated and as required by ASTM C 1364. Use galvanized reinforcement when covered with less than 1-1/2 inches (38 mm) of material.
- C. Fabricate units with sharp arris and details accurately reproduced with indicated texture on all exposed surfaces, unless otherwise indicated.
 - 1. Slope exposed horizontal surfaces at least 1:12, unless otherwise indicated.
 - 2. Provide raised fillets at backs of sills and at ends indicated to be built into jambs.
 - 3. Provide drips on projecting elements, unless otherwise indicated.
- D. Cure and finish units as follows:
 - 1. Cure units in totally enclosed curing room under dense fog and water spray at 95 percent relative humidity for 24 hours.
 - 2. Yard cure units until the sum of the mean daily temperatures for each day equals or exceeds 350 deg F.
 - 3. Acid etch units to remove cement film from surfaces indicated to be finished.
- E. Colors and Textures: As selected by Architect from manufacturer's full range for these characteristics:
 - 1. Match adjacent Concrete Masonry Units for color and texture

2.5 MORTAR MATERIALS

- A. Provide mortar materials that comply with Division 4 Section "Unit Masonry."
- B. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather

construction. Provide natural color, white, or a blend to produce mortar color indicated.

- C. Hydrated Lime: ASTM C 207, Type S.
- D. Portland Cement-Lime Mix: Packaged blend of portland cement complying with ASTM C 150, Type I or Type III, and hydrated lime complying with ASTM C 207.
 - 1. For pigmented mortars, use colored portland cement-lime mix of formulation required to produce color indicated or, if not indicated, as selected from manufacturer's standard formulations. Pigments shall not exceed 10 percent of portland cement by weight for mineral oxides or 2 percent for carbon black.
- E. Mortar Cement: ASTM C 1329.
 - 1. For pigmented mortars, use colored mortar cements of formulation required to produce color indicated or, if not indicated, as selected from manufacturer's standard formulations. Pigments shall not exceed 5 percent of mortar cement by weight for mineral oxides or 1 percent for carbon black.
- F. Mortar Aggregate: ASTM C 144.
 - 1. White-Mortar Aggregates: Natural, white sand or ground, white stone.
 - 2. Colored-Mortar Aggregates: Natural, colored sand or ground marble, granite, or other sound stone; as required to match Architect's sample.
- G. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with record of satisfactory performance in masonry mortars.
- H. Water: Potable.

2.6 ACCESSORIES

- A. Anchors: Type and size indicated, fabricated from stainless steel complying with ASTM A 276 or ASTM A 666, Type 304.
- B. Dowels: Round stainless-steel bars complying with ASTM A 276, Type 304, 1/2-inch (12-mm) diameter.
- C. Proprietary Acidic Cleaner: Manufacturer's standard-strength, general-purpose cleaner designed for removing mortar/grout stains, efflorescence, and other construction stains from new masonry surfaces without discoloring or damaging masonry surfaces; expressly approved for intended use by cast stone manufacturer and expressly approved by cleaner manufacturer for use on cast stone and adjacent masonry materials.
 - 1. Available Products: Subject to compliance with requirements, products that may be used to clean unit masonry surfaces include, but are not limited to, the following:
 - a. Sure Klean Vana Trol; ProSoCo, Inc.

2.7 MORTAR MIXES

- A. Comply with requirements in Division 4 Section "Unit Masonry" for mortar mixes.
- B. Setting Mortar: Comply with ASTM C 270, Proportion Specification, Type S.
 - 1. Limit cementitious materials to portland cement and lime.
 - 2. Pigmented Mortar: Select and proportion pigments with other ingredients to produce color required. Do not exceed pigment-to-cement ratio of 1:10, by weight.
 - 3. Packaged Portland Cement-Lime Mix Mortar: Use portland cement-lime mix of selected color.
 - 4. Mortar Cement Mortar: Use mortar cement of selected color.
 - 5. Colored-Aggregate Mortar: Produce color required by combining colored aggregates with portland cement of selected color.

2.8 SOURCE QUALITY CONTROL

- A. Employ an independent testing agency to sample and test cast stone units according to ASTM C 1364.
 - 1. Include testing for freezing and thawing resistance.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

- A. Install cast stone units to comply with requirements in Division 4 Section "Unit Masonry" for installing stone units.
- B. Set cast stone as indicated on Drawings. Install anchors, supports, fasteners, and other attachments indicated or necessary to secure units in place. Set units accurately in locations indicated with edges and faces aligned according to established relationships and indicated tolerances.
- C. Drench units with clear water just before setting.
- D. Set units in full bed of mortar with full head joints, unless otherwise indicated. Build anchors and ties into mortar joints as units are set.
 - 1. Fill dowel holes and anchor slots with mortar.
 - 2. Fill collar joint solid as units are set.
 - 3. Build concealed flashing into mortar joints as units are set.
 - 4. Leave head joints open in coping and other units with exposed horizontal surfaces. Keep joints clear of mortar, and rake out to receive sealant.
- E. Rake out joints for pointing with mortar to depths of not less than 3/4 inch (19 mm). Rake joints to uniform depths with square bottoms and clean sides. Scrub faces of units to remove

excess mortar as joints are raked.

- F. Point mortar joints by placing and compacting mortar in layers not greater than 3/8 inch (10 mm). Compact each layer thoroughly and allow to become thumbprint hard before applying next layer.
- G. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.
- H. Provide expansion, control, and pressure-relieving joints of widths and at locations indicated.
 - 1. Sealing joints is specified in Division 7 Section "Joint Sealants."
 - 2. Keep joints free of mortar and other rigid materials.
 - 3. Caulk top side of horizontal joints at cast stone and brick at the precast bands and window heads.

3.3 INSTALLATION TOLERANCES

- A. Variation from Plumb: Do not exceed 1/8 inch in 10 feet (3 mm in 3 m) or 1/4 inch in 20 feet (6 mm in 6 m) or more.
- B. Variation from Level: 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 (9 mm) maximum.
- C. Variation in Joint Width: Do not vary joint thickness more than 1/8 inch in 36 inches (3 mm in 900 mm) or one-fourth of nominal joint width, whichever is less.
- D. Variation in Plane between Adjacent Surfaces (Lipping): Do not exceed 1/16-inch (1.5-mm) difference between planes of adjacent units or adjacent surfaces indicated to be flush with units.

3.4 PATCHING

- A. The repair of chipped or damaged cast stone shall be done only by mechanics skilled in this class of work, with materials furnished by the manufacturer and according to his direction.
- B. Patching will not be permitted on copings and any other piece which can be removed and replaced without undue difficulty. Replace such pieces which are chipped or damaged with identical new pieces. Reseal and/or repoint to remove any evidence of replacement.
- C. Cast stone shall show no obvious repairs or imperfections other than minimal color variations when viewed with the unaided eye under good typical lighting at a ten (10) foot distance.

3.5 ADJUSTING AND CLEANING

- A. Remove and replace stained and otherwise damaged units and units not matching approved Samples. Cast stone may be repaired if methods and results are approved by Architect.
- B. Replace units in a manner that results in cast stone matching approved Samples, complying with other requirements, and showing no evidence of replacement.
- C. In-Progress Cleaning: Clean cast stone as work progresses. Remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed cast stone as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Protect adjacent surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.
3. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing thoroughly with clear water.
4. Clean cast stone by bucket and brush hand-cleaning method described in BIA Technical Notes No. 20 Revised II, using job-mixed detergent solution.
5. Clean cast stone with proprietary acidic cleaner applied according to manufacturer's written instructions.

END OF SECTION

SECTION 051200 - STRUCTURAL STEEL FRAMING

1.1 SUMMARY

A. Section Includes:

1. Structural-steel materials.
2. Shrinkage-resistant grout.

B. Related Requirements:

1. Section 051213 "Architecturally Exposed Structural Steel Framing" for additional requirements for architecturally exposed structural steel.
2. Section 055000 "Metal Fabrications" for steel lintels and shelf angles not attached to structural-steel frame, miscellaneous steel fabrications and other steel items not defined as structural steel.
3. Section 099113 "Exterior Painting" and Section 099123 "Interior Painting" for painting requirements.

1.2 DEFINITIONS

- #### A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in ANSI/AISC 303.

1.3 COORDINATION

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

1.4 ACTION SUBMITTALS

A. Product Data:

1. Structural-steel materials.
2. High-strength, bolt-nut-washer assemblies.
3. Anchor rods.
4. Shop primer.
5. Galvanized-steel primer.
6. Galvanized repair paint.
7. Shrinkage-resistant grout.

- #### B. Shop Drawings: Show fabrication of structural-steel components.

1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
 2. Include embedment Drawings.
 3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
 4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections.
 5. Identify members not to be shop primed.
- C. Delegated Design Submittal: For structural-steel connections indicated on Drawings to comply with design loads, include analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category BU or is accredited by the IAS Fabricator Inspection Program for Structural Steel (Acceptance Criteria 172).
- B. Installer Qualifications: A qualified Installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector.
- C. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.1/D1.1M.
 1. Welders and welding operators performing work on bottom-flange, demand-critical welds are to pass the supplemental welder qualification testing, as required by AWS D1.8/D1.8M. FCAW-S and FCAW-G are to be considered separate processes for welding personnel qualification.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.
 1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.
- B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.
 1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
 2. Clean and relubricate bolts and nuts that become dry or rusty before use.
 3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F3125/F3125M, Grade F1852 bolt assemblies and for retesting bolt assemblies after lubrication

2.1 PERFORMANCE REQUIREMENTS

- A. Comply with applicable provisions of the following specifications and documents:

1. ANSI/AISC 303.
- B. Connection Design Information:
1. Design connections and final configuration of member reinforcement at connections in accordance with ANSI/AISC 303 by fabricator's qualified professional engineer.
 - a. Use Load and Resistance Factor Design; data are given at factored-load level.
- C. Moment Connections: As indicated on the drawings.
- D. Construction: Combined system of moment frame and braced frame.
- 2.2 STRUCTURAL-STEEL MATERIALS
- A. W-Shapes: ASTM A992/A992M.
 - B. Channels, Angles: ASTM A36/A36M.
 - C. Plate and Bar: ASTM A36/A36M.
 - D. Cold-Formed Hollow Structural Sections: ASTM A500/A500M, Grade B structural tubing.
 - E. Steel Pipe: ASTM A53/A53M, Type E or Type S, Grade B.
 - F. Welding Electrodes: Comply with AWS requirements.
- 2.3 BOLTS AND CONNECTORS
- A. High-Strength A325 Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325, Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers; all with plain finish.
 - B. High-Strength A490 Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A490, Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers; all with plain finish.
- 2.4 RODS
- A. Headed Anchor Rods: ASTM F1554, Grade 36, straight.
 1. Nuts: ASTM A563 heavy-hex carbon steel.
 2. Plate Washers: ASTM A36/A36M carbon steel.
 3. Washers: ASTM F436, Type 1, hardened carbon steel.
 4. Finish: Plain.
 - B. Threaded Rods: ASTM A36/A36M.
 1. Nuts: ASTM A63 heavy-hex carbon steel.
 2. Washers: ASTM F436, Type 1, hardened carbon steel.
 3. Finish: Plain.

2.5 PRIMER

A. Steel Primer:

1. Comply with Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
2. SSPC-Paint 23, latex primer.
3. Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.

B. Galvanized-Steel Primer: MPI#26.

2.6 SHRINKAGE-RESISTANT GROUT

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

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

2.7 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate in accordance with ANSI/AISC 303 and to ANSI/AISC 360.

1. Fabricate beams with rolling camber up.
2. Identify high-strength structural steel in accordance with ASTM A6/A6M and maintain markings until structural-steel framing has been erected.
3. Mark and match-mark materials for field assembly.
4. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.

1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.

C. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.

D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted in accordance with SSPC-SP 1.

F. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel members.

1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.

3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.8 SHOP CONNECTIONS

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

2.9 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel in accordance with ASTM A123/A123M.
 1. Fill vent and drain holes that are exposed in the finished Work unless they function as weep holes, by plugging with zinc solder and filing off smooth.
 2. Galvanize lintels, shelf angles, and welded door frames attached to structural-steel frame and located in exterior walls.

2.10 SHOP PRIMING

- A. Shop prime steel surfaces, except the following:
 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
 2. Surfaces to be field welded.
 3. Surfaces of high-strength bolted, slip-critical connections.
 4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
 5. Galvanized surfaces.
 6. Corrosion-resisting (weathering) steel surfaces.
 7. Surfaces enclosed in interior construction.
- B. Surface Preparation of Steel: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces in accordance with the following specifications and standards:
 1. SSPC-SP 3.
- C. Surface Preparation of Galvanized Steel: Prepare galvanized-steel surfaces for shop priming by thoroughly cleaning steel of grease, dirt, oil, flux, and other foreign matter, and treating with etching cleaner or in accordance with SSPC-SP 16.

- D. Priming: Immediately after surface preparation, apply primer in accordance with manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
 - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
 - 2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

2.11 SOURCE QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform shop tests and inspections.
 - 1. Allow testing agency access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
 - 2. Bolted Connections: Inspect and test shop-bolted connections in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts."
 - 3. Welded Connections: Visually inspect shop-welded connections in accordance with AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
 - a. Liquid Penetrant Inspection: ASTM E165/E165M.
 - b. Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
 - c. Ultrasonic Inspection: ASTM E164.
 - d. Radiographic Inspection: ASTM E94/E94M.
 - 4. In addition to visual inspection, test and inspect shop-welded shear stud connectors in accordance with requirements in AWS D1.1/D1.1M for stud welding and as follows:
 - a. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear stud connector.
 - b. Conduct tests in accordance with requirements in AWS D1.1/D1.1M on additional shear stud connectors if weld fracture occurs on shear stud connectors already tested.
 - 5. Prepare test and inspection reports.

3.1 EXAMINATION

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

3.2 PREPARATION

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

3.3 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and in accordance with ANSI/AISC 303 and ANSI/AISC 360.
- B. Baseplates, Bearing Plates, and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
 - 1. Set plates for structural members on wedges, shims, or setting nuts as required.
 - 2. Weld plate washers to top of baseplate.
 - 3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
 - 4. Promptly pack shrinkage-resistant grout solidly between bearing surfaces and plates, so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for grouting.
- C. Maintain erection tolerances of structural steel within ANSI/AISC 303.
- D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that are in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
 - 1. Level and plumb individual members of structure. Slope roof framing members to slopes indicated on Drawings.
 - 2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.
- E. Splice members only where indicated.
- F. Do not use thermal cutting during erection.
- G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

3.4 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for bolt and joint type specified.
 - 1. Joint Type: Snug tightened.
- B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
 - 1. Comply with ANSI/AISC 303 and ANSI/AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
 - 2. Remove backing bars or runoff tabs where indicated, back gouge, and grind steel smooth.

3. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in ANSI/AISC 303 for mill material.

3.5 REPAIR

- A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing, and repair galvanizing to comply with ASTM A780/A780M.
- B. Touchup Painting:
 1. Immediately after erection, clean exposed areas where primer is damaged or missing, and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - a. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
 2. Cleaning and touchup painting are specified in Section 099113 "Exterior Painting." Section 099123 "Interior Painting."
- C. Touchup Priming: Cleaning and touchup priming are specified in Section 099600 "High-Performance Coatings."

3.6 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a special inspector to perform the following special inspections:
 1. Verify structural-steel materials and inspect steel frame joint details.
 2. Verify weld materials and inspect welds.
 3. Verify connection materials and inspect high-strength bolted connections.
- B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
 1. Bolted Connections: Inspect and test bolted connections in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts."
 2. Welded Connections: Visually inspect field welds in accordance with AWS D1.1/D1.1M.
 - a. In addition to visual inspection, test and inspect field welds in accordance with AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
 - 1) Liquid Penetrant Inspection: ASTM E165/E165M.
 - 2) Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
 - 3) Ultrasonic Inspection: ASTM E164.
 - 4) Radiographic Inspection: ASTM E94/E94M.

END OF SECTION

SECTION 053100 - STEEL DECKING

1.1 SUMMARY

A. Section Includes:

1. Roof deck.
2. Acoustical roof deck.

B. Related Requirements:

1. Section 051200 "Structural Steel Framing" for shop- and field-welded shear connectors.
2. Section 055000 "Metal Fabrications" for framing deck openings with miscellaneous steel shapes.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Roof deck.
2. Acoustical roof deck.

B. Shop Drawings:

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

1.3 INFORMATIONAL SUBMITTALS

A. Welding certificates.

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

C. Manufacturer's Certificate: For each type of steel deck, indicating compliance with SDI Specifications.

D. Test and Evaluation Reports:

1. Product Test Reports: For tests performed by a qualified testing agency, indicating that each of the following complies with requirements:
 - a. Power-actuated mechanical fasteners.
 - b. Acoustical roof deck.
2. Research Reports: For steel deck, from ICC-ES showing compliance with the building code.

E. Field Quality-Control Submittals:

1. Field quality-control reports.

F. Qualification Statements: For welding personnel and testing agency.

1.4 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel in accordance with SDI QA/QC and the following welding codes:
 - 1. AWS D1.1/D1.1M.
 - 2. AWS D1.3/D1.3M.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.
- B. Store products in accordance with SDI MOC3. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.
 - 1. Protect and ventilate acoustical cellular roof deck with factory-installed insulation to maintain insulation free of moisture.

2.1 PERFORMANCE REQUIREMENTS

- A. AISI Specifications: Comply with calculated structural characteristics of steel deck in accordance with AISI S100.
- B. Fire-Resistance Ratings: Comply with ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Indicate design designations from UL's "Fire Resistance Directory" or from listings of another qualified testing agency.

2.2 ROOF DECK

- A. Fabrication of Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with SDI RD and with the following:
 - 1. Galvanized-Steel Sheet: ASTM A653/A653M, Structural Steel (SS), Grade 33, G60 zinc coating.
 - 2. Aluminum-Zinc-Alloy-Coated Steel Sheet: ASTM A792/A792M, Structural Steel (SS), Grade 33 minimum, AZ50 aluminum-zinc-alloy coating.
 - 3. Deck Profile: As indicated.
 - 4. Cellular Deck Profile: As indicated, with bottom plate.
 - 5. Profile Depth: As indicated.
 - 6. Design Uncoated-Steel Thickness: As indicated.
 - 7. Design Uncoated-Steel Thicknesses; Deck Unit/Bottom Plate: As indicated.
 - 8. Span Condition: As indicated.
 - 9. Side Laps: Overlapped.

2.3 ACOUSTICAL ROOF DECK

- A. Fabrication of Acoustical Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with SDI RD and with the following:
1. Galvanized-Steel Sheet: ASTM A653/A653M, Structural Steel (SS), Grade 33, G60 zinc coating.
 2. Aluminum-Zinc-Alloy-Coated Steel Sheet: ASTM A792/A792M, Structural Steel (SS), Grade 33 minimum, AZ50 aluminum-zinc-alloy coating.
 3. Deck Profile: As indicated.
 4. Cellular Deck Profile: As indicated, with bottom plate.
 5. Profile Depth: As indicated.
 6. Design Uncoated-Steel Thickness: As indicated.
 7. Design Uncoated-Steel Thicknesses; Deck Unit/Bottom Plate: As indicated.
 8. Span Condition: As indicated.
 9. Side Laps: Overlapped.
 10. Acoustical Perforations: Deck units with manufacturer's standard perforated vertical webs.
 11. Sound-Absorbing Insulation: Manufacturer's standard premolded roll or strip of glass or mineral fiber.
 - a. Factory install sound-absorbing insulation into cells of cellular deck.
 12. Acoustical Performance: NRC 1.0, tested in accordance with ASTM C423.

2.4 ACCESSORIES

- A. Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.
- B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.
- C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.
- D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.
- E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.
- F. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi, of same material and finish as deck, and of thickness and profile recommended by SDI standards for overhang and slab depth.
- G. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck unless otherwise indicated.
- H. Piercing Hanger Tabs: Piercing steel sheet hanger attachment devices for use with floor deck.

- I. Weld Washers: Uncoated steel sheet, shaped to fit deck rib, 0.0747 inch thick, with factory-punched hole of 3/8-inch minimum diameter.
- J. Flat Sump Plates: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck. For drains, cut holes in the field.
- K. Recessed Sump Pans: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck, with 3-inch-wide flanges and level or sloped recessed pans of 1-1/2-inch minimum depth. For drains, cut holes in the field.
- L. Galvanizing Repair Paint: ASTM A780/A780M.
- M. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

3.1 EXAMINATION

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

3.2 INSTALLATION, GENERAL

- A. Install deck panels and accessories in accordance with SDI C, SDI NC, and SDI RD, as applicable; manufacturer's written instructions; and requirements in this Section.
- B. Install temporary shoring before placing deck panels if required to meet deflection limitations.
- C. Locate deck bundles to prevent overloading of supporting members.
- D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.
 - 1. Align cellular deck panels over full length of cell runs and align cells at ends of abutting panels.
- E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.
- F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.
- G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.
- H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.
- I. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install in accordance with deck manufacturer's written instructions.
- J. Shear Stud Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Weld using end welding of headed-stud shear connectors in accordance with AWS D1.1/D1.1M and manufacturer's written instructions.

3.3 INSTALLATION OF ROOF DECK

- A. Fasten roof-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter that is not less than 1-1/2 inches long, and as follows:
 - 1. Weld Diameter: As indicated.
 - 2. Weld Spacing: Weld edge and interior ribs of deck units with a minimum of two welds per deck unit at each support. Space welds as indicated.
 - 3. Weld Washers: Install weld washers at each weld location.
- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of one-half of the span or 36 inches, and as follows:
 - 1. Mechanically fasten with self-drilling, No. 10 diameter or larger, carbon-steel screws.
 - 2. Mechanically clinch or button punch.
 - 3. Fasten with a minimum of 1-1/2-inch-long welds.
- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:
 - 1. End Joints: Lapped 2 inches minimum.
- D. Roof Sump Pans and Sump Plates: Install over openings provided in roof deck and mechanically fasten flanges to top of deck. Space mechanical fasteners not more than 12 inches apart with at least one fastener at each corner.
 - 1. Install reinforcing channels or zees in ribs to span between supports and mechanically fasten.
- E. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels in accordance with deck manufacturer's written instructions. Weld or mechanically fasten to substrate to provide a complete deck installation.
 - 1. Weld cover plates at changes in direction of roof-deck panels unless otherwise indicated.
- F. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive in accordance with manufacturer's written instructions to ensure complete closure.

3.4 REPAIR

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint in accordance with ASTM A780/A780M and manufacturer's written instructions.
- B. Touch-Up Painting: Prime coat and touch-up painting will be considered adequate for metal deck, except where subjected to moisture or exposed to view.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Tests and Inspections:

1. Special inspections and qualification of welding special inspectors for cold-formed steel floor and roof deck in accordance with quality-assurance inspection requirements of SDI QA/QC.
 - a. Field welds will be subject to inspection.
 2. Steel decking will be considered defective if it does not pass tests and inspections.
 3. Shear Stud Connectors: In addition to visual inspection, test and inspect field-welded shear connectors in accordance with requirements in AWS D1.1/D1.1M for stud welding and as follows:
 - a. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
 - b. Conduct tests in accordance with requirements in AWS D1.1/D1.1M on additional shear connectors if weld fracture occurs on shear connectors that are already tested.
- C. Prepare test and inspection reports.

END OF SECTION

SECTION 054000 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Exterior non-load-bearing wall framing.
2. Exterior soffit framing.

B. Related Requirements:

1. Section 017419 "Construction Waste Management and Disposal."
2. Section 092118 "Gypsum Board Shaft Wall Assemblies" for interior non-load-bearing, metal-stud-framed, shaft-wall assemblies.
3. Section 092216 "Non-Structural Metal Framing" for interior non-load-bearing, metal-stud framing and ceiling-suspension assemblies.

1.2 PREINSTALLATION MEETINGS

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

1.3 ACTION SUBMITTALS

- A. Sustainable Design Submittals: Provide Sustainable Design Submittals in Accordance with Section 018113.

1. Building Product Disclosure Requirements: To encourage the use of building products that are working to minimize their environmental and health impacts, provide the following information when available:
 - a. Environmental Product Declaration: Submit with Product-specific Type III or Industry-wide Type III Environmental Product Declaration (EPD).
2. Recycled Content: The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.
3. Regional Materials: Materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles (160 km) of Project Site. If only a fraction of a product or material is extracted/harvested/recovered and manufactured locally, then only that percentage (by weight) shall contribute to the regional value.

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

C. Shop Drawings:

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

- D. Coordination Certification: Provide a certification letter from the installer of each cladding material

installed over the metal framing certifying that they have reviewed the shop drawings and the delegated design calculations and that the metal framing is coordinated with their work and suitable for the support of their work.

1. The CFMF shop drawings will not be reviewed without the Coordination Certificate.
- E. Delegated-Design Submittal: Structural calculations for cold-formed steel framing, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
1. Submit calculations concurrently with shop drawings.
 2. Include design for connections of cold-formed steel framing to primary structure.

1.4 INFORMATIONAL SUBMITTALS

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

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Company who is trained and experienced to install metal framing required for this Project.
1. Experience: Minimum five (5) years installing metal framing similar to that required for this Project.
 2. Completed three (3) projects of scope, schedule and complexity similar to this Project using systems similar to those required for this Project within last two (2) years as acceptable to Architect.
 3. Adequately trained for type of installation required for this Project.
- B. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.
- C. Product Tests: Mill certificates or data from a qualified independent testing agency, or in-house testing with calibrated test equipment indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.
- D. Delegated Design Engineer: Professional Engineer, licensed in Commonwealth of Pennsylvania and having a minimum of five (5) years documented experience engineering metal framing similar to that required for this Project.
- E. Welding Qualifications: Qualify procedures and personnel according to the following:
1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

1.6 DELIVERY, STORAGE, AND HANDLING

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

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. ClarkDietrich Building Systems.
 2. MarinoWARE.
 3. Nuconsteel; a Nucor Company.
 4. SCAFCO Corporation.
 5. Steelcraft; an Allegion Company
 6. United Metal Products, Inc.
 7. Or approved equal

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design cold-formed steel framing and to provide signed and sealed calculations for the design of cold-formed steel framing and its connection to the main structure.
1. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer.
 - a. Submittals related to structural design of cold-formed metal framing will be reviewed for design conformance only; the qualified professional engineer responsible for their preparation retains responsibility and liability for the system's design.
 - b. Sizes of cold-formed metal framing members indicated on Drawings are the minimum acceptable sizes. Determine actual size and thickness of members by structural calculations. Base design on requirements of authorities having jurisdiction, applicable codes, and design parameters indicated on structural Drawings.
- B. Structural Performance: Provide cold-formed steel framing capable of withstanding design loads within limits and under conditions indicated.
1. Dead Loads, General: As indicated on Drawings, including supporting eccentric dead load from facade system that is mounted on and supported by metal stud backup.
 - a. Determine actual dead loads of materials and coordinate with the specific products to be supported by cold-formed steel framing.
 2. Dead Loads for Exterior Soffit Framing: Soffit dead loads based on actual building construction indicated on Drawings, including metal panel soffit assemblies.
 3. Wind Loads: Criteria as indicated on Drawings.
 4. Seismic Loads: Criteria as indicated on Drawings.
 5. Deflection Limits: Design framing systems to withstand design loads without deflections greater

than the following:

- a. Exterior Non-Load-Bearing Framing: Horizontal deflection of 1/360 of the wall height.
 - b. Exterior Soffit Framing: Vertical deflection of 1/360 of the span for live loads and 1/240 for total loads of the span.
6. Design framing systems to provide for movement of framing members located outside the insulated building envelope without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.
 7. 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 1/2 inch.
 8. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.
 9. Design framing to support loads from overlying cladding and veneers, from adjacent curtain wall framing, and from other adjacent construction that imparts a load on the cold formed metal framing.
- C. Sub-Framing System: Provide a complete sub-framing system of girts, channels, angles, clips, and anchors as necessary to support the cladding off of the structure indicated on structural drawings and from the face of the exterior sheathing outwards to form drained cavity over insulation. Comply with the requirements of this Article.
- D. Cold-Formed Steel Framing Design Standards:
1. Wall Studs: AISI S211.
 2. Headers: AISI S212.
 3. Lateral Design: AISI S213.
- E. AISI Specifications and Standards: Unless more stringent requirements are indicated, comply with AISI S100 and AISI S200.
- ### 2.3 COLD-FORMED STEEL FRAMING, GENERAL
- A. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
1. Grade: As required by structural performance.
 2. Coating: G60 (Z180).
- B. Steel Sheet for Vertical Deflection Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:
1. Grade: As required by structural performance.
 2. Coating: G60 (Z180).
- ### 2.4 EXTERIOR NON-LOAD-BEARING WALL FRAMING
- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: As required by structural performance but not less than 0.0428 inch, 18 gauge.
 2. Flange Width: As required by structural performance but not less than 1-5/8 inches.
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: As required by structural performance but not less than 0.0428 inch, 18 gauge.
 - a. Heavy gage runner track at head or sill of curtain wall or other rough openings for attachment of curtain wall anchors or anchors for other items mounted in opening: Minimum 0.0966 inch, 12 gage.
 2. Flange Width: As required by structural performance.
- C. Vertical Deflection Clips: Manufacturer's standard bypass or head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AllSteel & Gypsum Products, Inc.
 - b. ClarkDietrich Building Systems.
 - c. MarinoWARE.
 - d. SCAFCO Corporation.
 - e. Steel Network, Inc. (The).
 - f. Steeler, Inc.
- D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:
1. Minimum Base-Metal Thickness: As required by structural performance but not less than 0.0428 inch, 18 gauge.
 2. Flange Width: 1 inch plus the design gap for one-story structures and 1 inch plus twice the design gap for other applications.

2.5 SOFFIT FRAMING

- A. Exterior Soffit Frame: Manufacturer's standard C-shaped steel sections, of web depths indicated, with stiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: As required by structural performance but not less than 0.0428 inch (1.09 mm), 18 gauge.
 2. Flange Width: As required by structural performance but not less than 1-5/8 inches (41 mm).
- B. Members Supporting Curtain Wall Dead Load: J-girts or other shapes at sills of curtain wall framing and supporting the dead load of the framing above shall be minimum base-metal thickness of 0.0966 inch.

2.6 FRAMING ACCESSORIES

- A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.
- B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
 - 1. Supplementary framing.
 - 2. Bracing, bridging, and solid blocking.
 - 3. Web stiffeners.
 - 4. Anchor clips.
 - 5. End clips.
 - 6. Foundation clips.
 - 7. Gusset plates.
 - 8. Stud kickers and knee braces.
 - 9. Hole reinforcing plates.
 - 10. Backer plates.

2.7 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.
- B. Anchor Bolts: ASTM F 1554, Grade 55, threaded carbon-steel hex-headed bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.
- C. Expansion Anchors: Fabricated from corrosion-resistant materials, with allowable load or strength design capacities calculated according to ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing per ASTM E 488 conducted by a qualified testing agency.
- D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.
- E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.
 - 1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.
- F. Welding Electrodes: Comply with AWS standards.

2.8 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: SSPC-Paint 20 or MIL-P-21035B or ASTM A 780.
- B. Shims: Load bearing, high-density multimonomer plastic, and nonleaching; or of cold-formed steel of same grade and coating as framing members supported by shims.
- C. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch (6.4 mm) thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

2.9 FABRICATION

- A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.
 - 1. Fabricate framing assemblies using jigs or templates.
 - 2. Cut framing members by sawing or shearing; do not torch cut.
 - 3. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by no fewer than three exposed screw threads.
 - 4. Fasten other materials to cold-formed steel framing by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.
- B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.
- C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:
 - 1. Spacing: Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
 - 2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Before installing exterior girts or furring, examine air barrier, waterproofing, roofing and other similar materials to verify a continuous waterproof membrane.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

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

3.3 INSTALLATION, GENERAL

- A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.
- B. Install cold-formed steel framing according to AISI S200 and to manufacturer's written instructions unless more stringent requirements are indicated.

- C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.
 - 1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true- to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.
- D. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.
 - 1. Cut framing members by sawing or shearing; do not torch cut.
 - 2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.
- E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.
- F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.
- G. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.
- H. Install insulation, specified in Section 072100 "Thermal Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.
- I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.
- J. Erection Tolerances: Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:
 - 1. Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

- A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.
- B. Fasten both flanges of studs to top and bottom track unless otherwise indicated. Space studs as follows:
 - 1. Stud Spacing: As required by structural performance but not less than 16 inches.

- C. Extra Framing to Support Cladding: Provide extra framing at locations required for anchoring of cladding.
- D. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.
- E. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
 - 1. Install single deep-leg deflection tracks and anchor to building structure.
 - 2. Connect vertical deflection clips to bypassing or infill studs and anchor to building structure.
- F. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Shop Drawings but not more than 48 inches apart or as determined by structural performance. Fasten at each stud intersection.
 - 1. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches of single deflection track. Install a combination of bridging and stud or stud-track solid blocking of width and thickness matching studs, secured to stud webs or flanges.
 - a. Install solid blocking at centers indicated on Shop Drawings as required by structural performance.
 - 2. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
 - 3. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
 - 4. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.
- G. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.5 ZEE GIRTS AND CLADDING SUB-FRAMING INSTALLATION

- A. Install girts and framing members: Z, C, and J-shaped steel members as required to support cladding per shop drawings and as required to support the cladding.
- B. Anchors for girts and sub-framing shall always engage CFMF.
 - 1. Anchor to CFMF using screws with neoprene washers. If washers are not present, solvent wipe screw head and apply sealant.
 - 2. Anchors driven that do not engage CFMF shall be removed and the air barrier sealed.
- C. Girts supporting curtain wall deadload: Install heavy gage J-girts or other shapes at sills of storefront framing and where indicated.
- D. Do not bridge movement joints in CFMF or sheathing with zee girts and sub-framing.
- E. Install to drain water. Install zee-girts with pitch away from air barrier. Any member installed that could trap or dam water shall be punched for drainage.
- F. Provide flashing membranes, mastics, sealants, gaskets and other accessories to maintain air barrier in a watertight condition as required by air barrier manufacturer.

3.6 FIELD QUALITY CONTROL

- A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Field and shop welds will be subject to testing and inspecting.
- C. Testing agency will report test results promptly and in writing to Contractor and Architect.
- D. Remove and replace work where test results indicate that it does not comply with specified requirements.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.7 REPAIRS AND PROTECTION

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

END OF SECTION

SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel framing and supports for overhead gymnasium divider curtain.
2. Steel framing and supports for mechanical and electrical equipment.
3. Steel framing and supports for applications where framing and supports are not specified in other Sections.
4. Elevator machine beams, hoist beams, and divider beams.
5. Steel shapes for supporting elevator door sills.
6. Slotted channel framing.
7. Shelf angles.
8. Metal ladders.
9. Elevator pit sump covers.
10. Metal bollards.
11. Loose bearing and leveling plates for applications where they are not specified in other Sections.
12. Miscellaneous aluminum trim, including trim for tackboard assemblies.
13. Abrasive metal nosings
14. Metal downspout boots

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

1. Loose steel lintels.
2. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
3. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.

C. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for installing anchor bolts, steel pipe sleeves, slotted-channel inserts, wedge-type inserts, and other items cast into concrete.
2. Section 042613 "Masonry Veneer" for installing loose lintels, anchor bolts, and other items built into unit masonry.
3. Section 051200 "Structural Steel Framing."

1.2 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of metal fabrications that are anchored to or that receive other work. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.3 ACTION SUBMITTALS

- A. Sustainable Design Submittals: Provide Sustainable Design Submittals in Accordance with Section 018113.
 - 1. Building Product Disclosure Requirements: To encourage the use of building products that are working to minimize their environmental and health impacts, provide the following information when available:
 - a. Environmental Product Declaration: Submit with Product-specific Type III or Industry-wide Type III Environmental Product Declaration (EPD).
 - 2. Recycled Content: The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.
 - 3. Regional Materials: Materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles (160 km) of Project Site. If only a fraction of a product or material is extracted/harvested/recovered and manufactured locally, then only that percentage (by weight) shall contribute to the regional value.
- B. Product Data: For the following:
 - 1. Steel framing support system for countertops
- C. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
- D. Delegated-Design Submittal: For ladders, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For professional engineer.
- B. Welding certificates
- C. Consider retaining "Paint Compatibility Certificates" Paragraph below if primers are fully specified in this Section rather than in painting Sections.
- D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.
- E. Research/Evaluation Reports: For post-installed anchors, from ICC-ES.

1.5 QUALITY ASSURANCE

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

1.6 FIELD CONDITIONS

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design ladders.
- B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- C. Steel Tubing: ASTM A 500/A 500M, cold-formed steel tubing.
- D. Steel Pipe: ASTM A 53/A 53M, Standard Weight (Schedule 40) unless otherwise indicated.
- E. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.
1. Size of Channels: 1-5/8 by 1-5/8 inches, unless otherwise indicated.
 2. Material: Galvanized steel, ASTM A 653/A 653M, structural steel, Grade 33], with G90 coating; 0.108-inch nominal thickness.
 3. Material: Cold-rolled steel, ASTM A 1008/A 1008M, structural steel, Grade 33; 0.0966-inch minimum thickness; hot-dip galvanized after fabrication.
- F. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.
- G. Aluminum Plate and Sheet: ASTM B 209, Alloy 6061-T6.
- H. Aluminum Extrusions: ASTM B 221, Alloy 6063-T6.
- I. Aluminum-Alloy Rolled Tread Plate: ASTM B 632/B 632M, Alloy 6061-T6.
- J. Aluminum Castings: ASTM B 26/B 26M, Alloy 443.0-F.

2.3 FASTENERS

- A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
- B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.
- C. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.
 - 1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.
- D. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.
- E. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.
- F. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.
 - 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
 - 2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.
- G. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 7/8 inches by length indicated with anchor straps or studs not less than 3 inches long at not more than 8 inches o.c. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B 633, Class Fe/Zn 5, as needed for fastening to inserts.

2.4 MISCELLANEOUS MATERIALS

- A. Shop Primers: Provide primers that comply with Section 099000 "Painting and Coating."
- B. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.5 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work with accurate angles and surfaces and straight edges.
- E. Weld corners and seams continuously to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.
- G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
- J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
- B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
 - 1. Fabricate units from slotted channel framing where indicated.
 - 2. Furnish inserts for units installed after concrete is placed.
- C. Galvanize miscellaneous framing and supports where indicated.

2.7 Aluminum framing support system for countertops

- A. Vanity brackets: Surface mounted bracket fabricated from miter cut and welded aluminum sections.
 - 1. Basis-of-Design Product: Rangine Corporation Raaks ADA Compliant Vanity Support System
 - 2. Configuration: C shaped with vertical rear leg for attachment to wall, horizontal member for supporting vanity top, and vertical front leg with sloped return for attachment of front baffle.

3. Size: As indicated on Drawings.

2.8 SHELF ANGLES

- A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inch bolts, spaced not more than 6 inches from ends and 24 inches o.c., unless otherwise indicated.
 1. Provide mitered and welded units at corners.
 2. Provide open joints in shelf angles at expansion and control joints. Make open joint approximately 2 inches larger than expansion or control joint.
- B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete.
- C. Galvanize and prime shelf angles located in exterior walls.

2.9 METAL LADDERS

- A. General:
 1. Comply with ANSI A14.3, except for elevator pit ladders.
 2. For elevator pit ladders, comply with ASME A17.1/CSA B44.
- B. Steel Ladders:
 1. Space siderails [18 inches] apart unless otherwise indicated.
 2. Siderails: Continuous, 1/2-by-2-1/2-inch steel flat bars, with eased edges.
 3. Rungs: 3/4-inch- diameter steel bars.
 4. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
 5. Provide nonslip surfaces on top of each rung, either by coating rung with aluminum-oxide granules set in epoxy-resin adhesive or by using a type of manufactured rung filled with aluminum-oxide grout.
 6. Support each ladder at top and bottom and not more than 60 inches o.c. with welded or bolted steel brackets.
 7. Galvanize ladders, including brackets.

2.10 ELEVATOR PIT SUMP COVERS

- A. Fabricate from 3/16-inch plate with four 1-inch- diameter holes for water drainage and for lifting.
- B. Provide steel angle supports as indicated.

2.11 MISCELLANEOUS STEEL TRIM

- A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.
- B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.
- C. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.

- D. Galvanize exterior miscellaneous steel trim.
 - E. Prime miscellaneous steel trim with primer specified in Section 099600 "Paints and Coatings."
- 2.12 METAL BOLLARDS
- A. Fabricate metal bollards from Schedule 40 steel pipe.
 - 1. Cap bollards with 1/4-inch- thick, steel plate with flat top.
 - 2. Where bollards are indicated to receive controls for door operators, provide cutouts for controls and holes for wire.
 - 3. Where bollards are indicated to receive light fixtures, provide cutouts for fixtures and holes for wire.
 - B. Fabricate bollards with 3/8-inch- thick, steel baseplates for bolting to concrete slab. Drill baseplates at all four corners for 3/4-inch anchor bolts.
 - 1. Where bollards are to be anchored to sloping concrete slabs, angle baseplates for plumb alignment of bollards.
 - C. Prime steel bollards with primer specified in Section 099000 "Painting and Coating."
- 2.13 LOOSE BEARING AND LEVELING PLATES
- A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.
 - B. Galvanize plates.
- 2.14 LOOSE STEEL LINTELS
- A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.
 - B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span, but not less than 8 inches unless otherwise indicated.
 - C. Galvanize loose steel lintels located in exterior walls.
- 2.15 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.

2.16 ABRASIVE METAL NOSINGS

- A. Cast-Metal Units: Cast aluminum with an integral-abrasive, as-cast finish consisting of aluminum oxide, silicon carbide, or a combination of both. Fabricate units in lengths necessary to accurately fit openings or conditions.
 - 1. Location: At interior cast-in-place concrete stair treads
 - 2. Source Limitations: Obtain units from single source from single manufacturer.
 - 3. Nosings: Cross-hatched units, 4 inches wide with 1-inch lip, for casting into concrete.
- B. Provide anchors for embedding units in concrete, either integral or applied to units, as standard with manufacturer.
- C. Drill for mechanical anchors and countersink. Locate holes not more than 4 inches from ends and not more than 12 inches o.c., evenly spaced between ends, unless otherwise indicated. Provide closer spacing if recommended by manufacturer.
 - 1. Provide two rows of holes for units more than 5 inches wide, with two holes aligned at ends and intermediate holes staggered.
- D. Apply bituminous paint to concealed surfaces of cast-metal units.
- E. Apply clear lacquer to concealed surfaces of extruded units.

2.17 METAL DOWNSPOUT BOOTS

- A. Source Limitations: Obtain downspout boots from single source from single manufacturer.
- B. Provide downspout boots made from cast iron in heights indicated with inlets of size and shape to suit downspouts. Provide units with flanges and holes for countersunk anchor bolts.
 - 1. [Zurn](#) Industries Z-191RD or similar
 - 2. Outlet: Horizontal, to discharge into pipe
- C. Prime cast-iron downspout boots with zinc-rich primer.

2.18 FINISHES, GENERAL

- A. Finish metal fabrications after assembly.
- B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface

2.19 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.
 - 1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
- B. Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.

- C. Shop prime iron and steel item unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
 - 1. Shop prime with primers specified in Section 099000 "Painting and Coating".
- D. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 3, "Power Tool Cleaning."
- E. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
 - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

2.20 ALUMINUM FINISHES

- A. As-Fabricated Finish: AA-M12.
- B. Clear Anodic Finish: AAMA 611, Class I, AA-M12C22A41.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.
- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.
- B. Anchor supports for [ceiling hung toilet partitions] [operable partitions] [overhead doors] [and] [overhead grilles] securely to, and rigidly brace from, building structure.
- C. Support steel girders on solid grouted masonry, concrete, or steel pipe columns. Secure girders with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns.
 - 1. Where grout space under bearing plates is indicated for girders supported on concrete or masonry, install as specified in "Installing Bearing and Leveling Plates" Article.
- D. Install pipe columns on concrete footings with grouted baseplates. Position and grout column baseplates as specified in "Installing Bearing and Leveling Plates" Article.
 - 1. Grout baseplates of columns supporting steel girders after girders are installed and leveled.

3.3 INSTALLATION OF METAL BOLLARDS

- A. Fill metal-capped bollards solidly with concrete and allow concrete to cure seven days before installing.
- B. Anchor bollards to existing construction with anchor bolts. Provide four 3/4-inch bolts at each bollard unless otherwise indicated.
 - 1. Embed anchor bolts at least 4 inches in concrete.

3.4 INSTALLING BEARING AND LEVELING PLATES

- A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.
- B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with nonshrink grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.5 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - 1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
- B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in [Section 099113 "Exterior Painting."] [Section 099123 "Interior Painting."]

C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

END OF SECTION

SECTION 055113 - METAL PAN STAIRS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel stairs with concrete-filled treads.

1.2 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorages for metal stairs. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- C. Coordinate locations of hanger rods and struts with other work so that they do not encroach on required stair width and are within the fire-resistance-rated stair enclosure.

1.3 ACTION SUBMITTALS

- A. Sustainable Design Submittals: Provide Sustainable Design Submittals in Accordance with Section 018113.
 1. Building Product Disclosure Requirements: To encourage the use of building products that are working to minimize their environmental and health impacts, provide the following information when available:
 - a. Environmental Product Declaration: Submit with Product-specific Type III or Industry-wide Type III Environmental Product Declaration (EPD).
 2. Recycled Content: The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.
 3. Regional Materials: Materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles (160 km) of Project Site. If only a fraction of a product or material is extracted/harvested/recovered and manufactured locally, then only that percentage (by weight) shall contribute to the regional value.
- B. Product Data: For metal pan stairs and paint products.
- C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
- D. Delegated-Design Submittal: For stairs and railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

1.5 QUALITY ASSURANCE

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design stairs and railings.
- B. Structural Performance of Stairs: Metal stairs shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Uniform Load: 100 lbf/sq. ft. (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 to L/360 or 1/4 inch (6.4 mm), whichever is less.
- C. Structural Performance of Railings: Railings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Handrails and Top Rails of Guards:
 - a. Uniform load of 50 lbf/ft. (0.73 kN/m) applied in any direction.
 - b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 - 2. Infill of Guards:
 - a. Concentrated load of 50 lbf (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m).
 - b. Infill load and other loads need not be assumed to act concurrently.

2.2 METALS

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

- B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- C. Steel Tubing: ASTM A 500 (cold formed) or ASTM A 513.
- D. Uncoated, Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, either commercial steel, Type B, or structural steel, Grade 25 (Grade 170), unless another grade is required by design loads; exposed.

2.3 FASTENERS

- A. General: Provide zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 12 for exterior use, and Class Fe/Zn 5 where built into exterior walls. Select fasteners for type, grade, and class required.
- B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with hex nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.
- C. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.
- D. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.
 - 1. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 (A1) stainless-steel bolts, ASTM F593, and nuts, ASTM F594 (ASTM F836M).
 - 2. Material: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, unless otherwise indicated.

2.4 MISCELLANEOUS MATERIALS

- A. Shop Primers: Provide primers that comply with Section 099000 "Painting and Coating."
- B. Concrete Materials and Properties: Comply with requirements in Section 033000 "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.

2.5 FABRICATION, GENERAL

- A. Provide complete stair assemblies, including metal framing, hangers, struts, railings, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.
 - 1. Join components by welding unless otherwise indicated.
 - 2. Use connections that maintain structural value of joined pieces.
- B. Preassembled Stairs: Assemble stairs in shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- D. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- E. Form exposed work with accurate angles and surfaces and straight edges.
- F. Weld connections to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. Weld exposed corners and seams continuously unless otherwise indicated.
 - 5. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 2 welds: completely sanded joint, some undercutting and pinholes are okay.
- G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts unless otherwise indicated. Locate joints where least conspicuous.

2.6 STEEL-FRAMED STAIRS

- A. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM AMP 510, "Metal Stairs Manual," Commercial Class, unless more stringent requirements are indicated.
- B. Stair Framing:
 - 1. Fabricate stringers as indicated on Drawings.
 - a. Provide closures for exposed ends of channel stringers and rectangular tube stringers.
 - b. Finish: Shop primed
 - 2. Construct platforms of steel wide-flange members, channel headers or rectangular tube and miscellaneous framing members as indicated on drawings as needed to comply with performance requirements.
 - 3. Weld stringers to headers; weld framing members to stringers and headers.
 - 4. Where masonry walls support metal stairs, provide temporary supporting struts designed for erecting steel stair components before installing masonry.
- C. Metal Pan Stairs: Form risers, subtread pans, and subplatforms to configurations shown from steel sheet of thickness needed to comply with performance requirements, but not less than 0.067 inch (1.7 mm).
 - 1. Steel Sheet: Uncoated cold-rolled steel sheet.
 - 2. Directly weld metal pans to stringers; locate welds on top of subtreads where they are concealed by concrete fill. Do not weld risers to stringers.
 - 3. Shape metal pans to include nosing integral with riser.

4. Provide subplatforms of configuration indicated or, if not indicated, the same as subreads. Weld subplatforms to platform framing.

2.7 STAIR RAILINGS

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

2.8 FINISHES

- A. Finish metal stairs after assembly.
- B. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 3, "Power Tool Cleaning."
- C. Apply shop primer to uncoated surfaces of metal stair components, except those with galvanized finishes and those to be embedded in concrete or masonry unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

PART 3 - EXECUTION

3.1 INSTALLING METAL PAN STAIRS

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.
- C. Install hanger rods, struts, and connections concealed within stairway walls where they will not be visible in the completed Work, unless otherwise indicated.
- D. Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete unless otherwise indicated.
- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- F. 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.
- G. Field Welding: Comply with requirements for welding in "Fabrication, General" Article.
- H. Place and finish concrete fill for treads and platforms to comply with Section 033000 "Cast-in-Place Concrete."

3.2 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - 1. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION

SECTION 055213 - PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Steel railings at interior egress stairs
- B. Related Requirements:
 - 1. Section 055113 "Metal Pan Stairs" for steel tube railings associated with metal pan stairs.
 - 2. Section 057300 "Decorative Metal Railings" for tube railings associated with Lobby interior ramps and stairs

1.2 ACTION SUBMITTALS

- A. Sustainable Design Submittals: Provide Sustainable Design Submittals in Accordance with Section 018113.
 - 1. Building Product Disclosure Requirements: To encourage the use of building products that are working to minimize their environmental and health impacts, provide the following information when available:
 - a. Environmental Product Declaration: Submit with Product-specific Type III or Industry-wide Type III Environmental Product Declaration (EPD).
 - 2. Recycled Content: The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.
 - 3. Regional Materials: Materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles (160 km) of Project Site. If only a fraction of a product or material is extracted/harvested/recovered and manufactured locally, then only that percentage (by weight) shall contribute to the regional value.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
- C. Delegated-Design Submittal: For railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For delegated-design professional engineer
- B. Welding certificates.

1.4 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel in accordance with the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design railings, including attachment to building construction.
- B. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Handrails and Top Rails of Guards:
 - a. Uniform load of 50 lbf/ ft applied in any direction.
 - b. Concentrated load of 200 lbf applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 - 2. Infill of Guards:
 - a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft.
 - b. Infill load and other loads need not be assumed to act concurrently.

2.2 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.
 - 1. Provide type of bracket with flange tapped for concealed anchorage to threaded hanger bolt and that provides 1-1/2-inch clearance from inside face of handrail to finished wall surface.

2.3 STEEL RAILINGS

- A. Tubing: ASTM A500/A500M (cold formed)
- B. Pipe: ASTM A53/A53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.
- C. Plates, Shapes, and Bars: ASTM A36/A36M.
- D. Cast Iron Fittings: Either gray iron, ASTM A48/A48M, or malleable iron, ASTM A47/A47M, unless otherwise indicated.

2.4 FASTENERS

- A. Fastener Materials:
 - 1. Ungalvanized-Steel Railing Components: Plated steel fasteners complying with ASTM F1941 Class Fe/Zn 5 for zinc coating.
 - 2. Stainless Steel Railing Components: Type 304 stainless steel fasteners.

- 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 and capable of withstanding design loads.
- C. Fasteners for Interconnecting Railing Components: Retain one of first two subparagraphs below.
 - 1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless otherwise indicated.
- D. Post-Installed Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193
 - 1. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, unless otherwise indicated.
 - 2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless steel bolts, ASTM F593, and nuts, ASTM F594.

2.5 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select in accordance with AWS specifications for metal alloy welded.
- B. Shop Primers: Provide primers that comply with Division 09 painting and coatings Sections.
- C. Bituminous Paint: Cold-applied asphalt emulsion, complying with ASTM D1187/D1187M.
- D. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout, complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- E. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.

2.6 FABRICATION

- A. Shop assemble railings to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations.
 - 1. Clearly mark units for reassembly and coordinated installation.
 - 2. Use connections that maintain structural value of joined pieces.
- B. Cut, drill, and punch metals cleanly and accurately.
 - 1. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated.
 - 2. Remove sharp or rough areas on exposed surfaces.
- C. Form work true to line and level with accurate angles and surfaces.
- D. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.

- E. 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 welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #3 welds; utilitarian appearance not subject to view, partially dressed weld with spatter removed.
- F. Form changes in direction by bending unless otherwise indicated.
- G.
- H. Bend members in jigs to produce uniform curvature for each configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- I. Close exposed ends of hollow railing members with prefabricated cap and end fittings of same metal and finish as railings.
- J. 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.
- K. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.
- L. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work.
 - 1. Fabricate anchorage devices capable of withstanding loads imposed by railings.
 - 2. Coordinate anchorage devices with supporting structure.
- M. For railing posts set in concrete, provide stainless steel sleeves not less than 6 inches (150 mm) long with inside dimensions not less than 1/2 inch (13 mm) greater than outside dimensions of post, with metal plate forming bottom closure.
- N. For removable railing posts, fabricate slip-fit sockets from stainless steel tube or pipe whose ID is sized for a close fit with posts; limit movement of post without lateral load, measured at top, to not more than one-fortieth of post height.
 - 1. Provide socket covers designed and fabricated to resist being dislodged.
 - 2. Provide chain with eye, snap hook, and staple across gaps formed by removable railing sections at locations indicated. Fabricate from same metal as railings.

2.7 STEEL AND IRON FINISHES

- A. For nongalvanized-steel railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves; however, hot-dip galvanize anchors to be embedded in exterior concrete or masonry.
- B. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 3

- C. Primer Application: Apply shop primer to prepared surfaces of railings unless otherwise indicated. Comply with requirements in SSPC-PA 1 for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Perform cutting, drilling, and fitting required for installing railings.
 - 1. Fit exposed connections together to form tight, hairline joints.
 - 2. Install railings level, plumb, square, true to line; without distortion, warp, or rack.
 - 3. Set railings accurately in location, alignment, and elevation; measured from established lines and levels.
 - 4. Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
 - 5. Set posts plumb within a tolerance of 1/16 inch in 3 feet (2 mm in 1 m).
 - 6. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet (6 mm in 3.5 m).
- B. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
 - 1. Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
- 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.

3.2 RAILING CONNECTIONS

- A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article, whether welding is performed in the shop or in the field.

3.3 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] [or] [anchoring cement], mixed and placed to comply with anchoring material manufacturer's written instructions.
- B. Leave anchorage joint exposed with [1/8-inch (3-mm) buildup, anchoring material flush with adjacent surface.

3.4 REPAIR

- A. Touchup Painting:

1. Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - a. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.

3.5 PROTECTION

- A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.
- B. Restore finishes damaged during installation and construction period, so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION

SECTION 055215 – EXTERIOR HANDRAILS AND GUARDRAILS

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. Stainless steel handrails
 - 2. Stainless steel guardrails

1.3 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design railings, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. General: In engineering railings to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:
 - 1. Steel: 72 percent of minimum yield strength.
 - 2. Stainless Steel: 60 percent of minimum yield strength.
- C. Structural Performance: Railings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Handrails and Top Rails of Guards:
 - a. Uniform load of 50 lbf/ ft. (0.73 kN/m) applied in any direction.
 - b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 - 2. Infill of Guards:
 - a. Concentrated load of 50 lbf (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m).
 - b. Infill load and other loads need not be assumed to act concurrently.
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
 - 1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

- E. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.4 ACTION SUBMITTALS

- A. Product Data for each type of product indicated, including finishing materials and color chart for selection.
- A. Shop Drawings: Indicate profiles, sizes, anchorage, and accessories. Indicate materials of each item. Provide plans, elevations, and details as required to clearly illustrate the full scope of work. Include material information, finishes, and types of joinery, fasteners, anchorages, and accessory items.
 - 1. Delegated Design: Include structural analysis data, signed and sealed by a qualified professional engineer responsible for analysis preparation.
 - 2. Verify actual conditions by field measurements before fabrication and indicate measurements on shop drawings.
- B. Samples for Initial Selection: For products involving selection of color, texture, or design, including finishes on stainless steel.
- C. Samples for Verification: For each type of exposed finish required.
 - 1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters.
 - 2. Fittings and brackets.

1.5 INFORMATIONAL SUBMITTALS

- A. Mill Certificates: Signed by manufacturers of stainless-steel products certifying that products furnished comply with requirements.
- B. Welding certificates.

1.6 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of railing from single source from single manufacturer.
- B. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.6, "Structural Welding Code - Stainless Steel."

1.7 PROJECT CONDITIONS

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

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 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.

2.2 STAINLESS STEEL

- A. Tubing: ASTM A 554, Grade MT 316L.
- B. Pipe: ASTM A 312/A 312M, Grade TP 316L.
- C. Plate and Sheet: ASTM A 240/A 240M or ASTM A 666, Type 316L.

2.3 FASTENERS

- A. General: Provide the following:
 - 1. Stainless-Steel Railings: Type 316 stainless-steel fasteners.
- B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.
- C. Fasteners for Interconnecting Railing Components:
 - 1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless otherwise indicated.
 - 2. Provide tamper-resistant flat-head machine screws for exposed fasteners unless otherwise indicated.
- D. Post-Installed Anchors: Chemical anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

1. Material for Exterior Locations and Where Stainless Steel is Indicated: Alloy Group 2 (A4) stainless-steel bolts, ASTM F 593 (ASTM F 738M), and nuts, ASTM F 594 (ASTM F 836M).

2.4 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
 1. For stainless-steel railings, provide type and alloy as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.
- B. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for exterior applications.

2.5 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 welded connections unless otherwise indicated.
- H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 2. Obtain fusion without undercut or overlap.
 3. Remove flux immediately.
 4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
- I. Form changes in direction as follows:
 1. As detailed.

- J. Bend members in jigs to produce uniform curvature for each 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 (6 mm) 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.
- N. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.
- O. For railing posts set in concrete, provide stainless-steel sleeves not less than 6 inches long with inside dimensions not less than 1/2 inch greater than outside dimensions of post, with metal plate forming bottom closure.

2.6 FINISHES, GENERAL

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

2.7 STAINLESS STEEL FINISH

- A. Remove tool and die marks and stretch lines, or blend into finish.
- B. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.
- C. Dull Satin Finish: No. 6.
- D. 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. Fit exposed connections together to form tight, hairline joints.
- B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
 - 1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
 - 2. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
 - 3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.
- C. Corrosion Protection: Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
- D. Adjust railings before anchoring to ensure matching alignment at abutting joints.
- E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.2 RAILING CONNECTIONS

- A. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. 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 "Fabrication" Article whether welding is performed in the shop or in the field.
- C. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches (50 mm) beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6 inches (150 mm) of post.

3.3 ANCHORING POSTS

- A. Use metal sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.
- B. Form or core-drill holes not less than 8 inches deep and 3/4 inch larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete

with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.

- C. Grout of anchorage joint to have 1/8-inch (3-mm) buildup, sloped away from post.
- D. Cover anchorage joint with flange of same metal as post, attached to post with set screws.

3.4 ADJUSTING AND CLEANING

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

3.5 PROTECTION

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

END OF SECTION 055200

SECTION 057300 - DECORATIVE METAL RAILINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Steel decorative railings for interior Lobby stairs and ramps
- B. Related Requirements:
 - 1. Section 055113 "Metal Pan Stairs" for stairs incorporating decorative metal railings.
 - 2. Section 064100 "Architectural Casework" for Lobby custom casework

1.2 COORDINATION AND SCHEDULING

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible.
- B. Coordinate installation of anchorages for 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 items to Project site in time for installation.

1.3 PREINSTALLATION MEETINGS

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

1.4 ACTION SUBMITTALS

- A. Product Data:
 - 1. Fasteners.
 - 2. Post-installed anchors.
 - 3. Shop primer.
 - 4. Nonshrink, nonmetallic grout.
 - 5. Anchoring cement.
- B. Shop Drawings: Include plans, elevations, sections, and attachment details.
- C. Samples for Initial Selection: For products involving selection of color, texture, or design.
- D. Samples for Verification: For each type of exposed finish required.
 - 1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters
 - 2. Welded connections.
- E. Delegated-Design Submittal: For railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For delegated-design professional engineer.

- B. Welding certificates.
- C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.
- D. Research Reports: For post-installed anchors, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

1.6 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.6/D1.6M, "Structural Welding Code – Stainless Steel."

1.7 FIELD CONDITIONS

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design railings, including attachment to building construction.
- B. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Handrails and Top Rails of Guards:
 - a. Uniform load of 50 lbf/ft. (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.

2.2 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: Same metal and finish as supported rails unless otherwise indicated.

2.3 STEEL DECORATIVE RAILINGS

- A. Source Limitations: Obtain steel decorative railing components from single source from single manufacturer.
- B. Pipe: ASTM A312/A312M, Grade TP 304
- C. Castings: ASTM A743/A743M, Grade CF 8 or CF 20

2.4 FASTENERS

- A. Fastener Materials: Plated-steel fasteners complying with ASTM F1941/F1941M, Class Fe/Zn 5 for electrodeposited zinc coating where concealed; Type 304 stainless steel fasteners where exposed.

- B. Fasteners for Anchoring to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction and capable of withstanding design loads.
- C. Provide concealed fasteners for interconnecting railing components and for attaching railings to other work unless otherwise indicated.
- D. Post-Installed Anchors: Fastener systems with working capacity greater than or equal to the design load, in accordance with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193.
 - 1. Material: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, unless otherwise indicated.

2.5 MISCELLANEOUS MATERIALS

- A. Handrail Brackets:
 - 1. Provide either formed- or cast-metal brackets with predrilled hole for exposed bolt anchorage.
- B. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- C. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- D. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.

2.6 FABRICATION

- A. Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.
- B. Shop assemble railings to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations.
 - 1. Clearly mark units for reassembly and coordinated installation.
 - 2. Use connections that maintain structural value of joined pieces.
- C. Cut, drill, and punch metals cleanly and accurately.
 - 1. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated.
 - 2. Remove sharp or rough areas on exposed surfaces.
- D. Form work true to line and level with accurate angles and surfaces.
 - 1. Provide weep holes where water may accumulate.
 - 2. Locate weep holes in inconspicuous locations.
- E. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- F. Connections: Fabricate railings with welded 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 welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #1 welds; ornamental quality with no evidence of a welded joint.
- H. Form changes in direction by bending unless otherwise indicated.
- I. Bend members in jigs to produce uniform curvature for each configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- J. Close exposed ends of hollow railing members with prefabricated cap and end fittings of same metal and finish as railings.
- K. 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.
- L. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, handrail brackets, miscellaneous fittings, and anchors to interconnect railing members to other Work unless otherwise indicated.
 - 1. At brackets and fittings fastened to gypsum board partitions, provide crush-resistant fillers or other means to transfer loads through wall finishes to structural supports and to prevent bracket or fitting rotation and crushing of substrate.
- M. Provide inserts and other anchorage devices for connecting railings to concrete or masonry Work.
 - 1. Fabricate anchorage devices capable of withstanding loads imposed by railings.
 - 2. Coordinate anchorage devices with supporting structure.

2.7 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" recommendations for applying and designating finishes.

2.8 STAINLESS STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - 1. Run grain with long dimension of each piece.
 - 2. When polishing is completed, passivate and rinse surfaces.
 - 3. Remove embedded foreign matter and leave surfaces chemically clean.
- C. Stainless Steel Pipe and Tubing Finishes:
 - 1. 180-Grit Polished Finish: Uniform, directionally textured finish.
- D. Stainless Steel Sheet and Plate Finishes:

1. Directional Satin Finish: ASTM A480/A480, No. 4.

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. Perform cutting, drilling, and fitting required for installing railings.
 1. Fit exposed connections together to form tight, hairline joints.
 2. Install railings level, plumb, square, true to line; without distortion, warp, or rack.
 3. Set railings accurately in location, alignment, and elevation; measured from established lines and levels.
 4. 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.
 5. Set posts plumb within a tolerance of 1/16 inch in 3 feet (2 mm in 1 m).
 6. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet (6 mm in 3 m).
- B. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
- 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 ANCHORING POSTS

- A. Use stainless steel pipe sleeves preset and anchored into concrete for installing posts. After posts are inserted into sleeves, fill annular space between post and sleeve with [nonshrink, nonmetallic grout] [or] [anchoring cement], mixed and placed to comply with anchoring material manufacturer's written instructions.
- B. Form or core-drill holes not less than 5 inches (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 or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions.
- C. Cover anchorage joint with flange of same metal as post, attached to post with setscrews.
- D. Leave anchorage joint exposed with anchoring material flush with adjacent surface.
- E. Install removable railing sections, where indicated, in slip-fit stainless steel sockets cast in concrete.

3.4 ATTACHING RAILINGS

- A. Attach handrails to walls with wall brackets unless otherwise indicated. Provide brackets with 1-1/2-inch (38-mm) 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 unless otherwise indicated.
2. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

B. Secure wall brackets to building construction as follows:

1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
2. For hollow masonry anchorage, use toggle bolts.
3. For wood stud partitions, use hanger or lag bolts set into studs or wood backing between studs. Coordinate with carpentry work to locate backing members.
4. For steel-framed partitions, use hanger or lag bolts set into fire-retardant-treated wood backing between studs. Coordinate with stud installation to locate backing members.

3.5 PROTECTION

- A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.
- B. Restore finishes damaged during installation and construction period, so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION

SECTION 061053 - MISCELLANEOUS ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Wood blocking, cants, and nailers.
 - 2. Plywood backing panels.

- B. Related Requirements:
 - 1. Section 061600 "Gypsum Sheathing" for gypsum sheathing
 - 2. Section 075216 "SBS Modified Bituminous Membrane Roofing"
 - 3. Section 074113 "Stone Coated Metal Roof Panels"
 - 4. Section 092900 "Gypsum Board" for interior gypsum partitions

1.2 DEFINITIONS

- A. Boards or Strips: Lumber of less than 2 inches nominal (38 mm actual) size in least dimension.

- B. Dimension Lumber: Lumber of 2 inches nominal (38 mm actual) or greater size but less than 5 inches nominal (114 mm actual) size in least dimension.

1.3 ACTION SUBMITTALS

- A. Sustainable Design Submittals: Provide Sustainable Design Submittals in Accordance with Section 018113.
 - 1. Building Product Disclosure Requirements: To encourage the use of building products that are working to minimize their environmental and health impacts, provide the following information when available:
 - a. Environmental Product Declaration: Submit with Product-specific Type III or Industry-wide Type III Environmental Product Declaration (EPD).

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

1.4 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For the following, from ICC-ES:

1. Preservative-treated wood.
2. Fire-retardant-treated wood.
3. Power-driven fasteners.
4. Post-installed anchors.
5. Metal framing anchors.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.6 DELIVERY, STORAGE, AND HANDLING

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

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. 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. Dress lumber, S4S, unless otherwise indicated.

- B. Maximum Moisture Content of Lumber: 19 percent unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. Preservative Treatment by Pressure Process: AWP A U1; Use Category UC2.

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, chemical formulations shall not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.

- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.

- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

- D. Application: Treat items indicated on Drawings, and the following:
 - 1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.

2.3 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Where fire-retardant-treated materials are indicated, materials shall comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
- B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet (3.2 m) beyond the centerline of the burners at any time during the test.
 - 1. Treatment shall not promote corrosion of metal fasteners.
 - 2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
 - 3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.
 - 4. Design Value Adjustment Factors: Treated lumber shall be tested according to ASTM D 5664, and design value adjustment factors shall be calculated according to ASTM D 6841.
- C. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Kiln-dry plywood after treatment to a maximum moisture content of 15 percent.
- D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.
- E. Application: Treat items indicated on Drawings, and the following:
 - 1. Concealed blocking.
 - 2. Roof framing and blocking.
 - 3. Wood cants, nailers, curbs, equipment support bases, blocking, and similar members in connection with roofing.
 - 4. Plywood backing panels.

2.4 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
 - 1. Blocking.
 - 2. Nailers.
 - 3. Rooftop equipment bases and support curbs.
 - 4. Cants.
 - 5. Furring.
 - 6. Grounds.
 - 7. Utility shelving.

- B. Dimension Lumber Items: Construction or No. 2 grade lumber of any of the following species:
1. Hem-fir (north); NLGA.
 2. Mixed southern pine or southern pine; SPIB.
 3. Spruce-pine-fir; NLGA.
 4. Hem-fir; WCLIB or WWPA.
 5. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
 6. Northern species; NLGA.
- C. Utility Shelving: Lumber with 15 percent maximum moisture content of any of the following species and grades:
1. Eastern white pine, Idaho white, lodgepole, ponderosa, or sugar pine; Standard or No. 3 Common grade; NeLMA, NLGA, WCLIB, or WWPA.
 2. Mixed southern pine or southern pine [No. 1] [No. 2] grade; SPIB.
 3. Hem-fir or hem-fir (north), Construction or No. 2 Common grade; NLGA, WCLIB, or WWPA.
 4. Spruce-pine-fir (south) or spruce-pine-fir, Construction or No. 2 Common grade; NeLMA, NLGA, WCLIB, or WWPA.
- D. 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.
- E. 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.
- F. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.5 PLYWOOD BACKING PANELS

- A. Equipment Backing Panels: Plywood, DOC PS 1, Exterior, A-C in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness.
- B. Interior Gypsum Partition Backing Panels (concealed): Plywood, in thickness indicated or, if not indicated, not less than 1/2" 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. Screws for Fastening to Metal Framing: Length as recommended by screw manufacturer for material being fastened.
1. ASTM C 1002 for fastening to non-load-bearing steel framing.
 2. ASTM C 954 for fastening to cold-formed steel framing.

- D. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- E. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01, ICC-ES AC58, ICC-ES AC193 or ICC-ES AC308] as appropriate for the substrate.
 - 1. 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).

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- B. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry accurately to other construction. Locate[furring,] nailers, blocking, [grounds,]and similar supports to comply with requirements for attaching other construction.
- C. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant-treated plywood backing panels with classification marking of testing agency exposed to view.
- D. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.
- E. Do not splice structural members between supports unless otherwise indicated.
- F. 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.
- G. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:
 - 1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches (2438 mm) o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
 - 2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches (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.
 - 3. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than 100 sq. ft. (9.3 sq. m) and to solidly fill space below partitions.
 - 4. Fire block concealed spaces behind combustible cornices and exterior trim at not more than 20 feet (6 m) o.c.

- H. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- I. 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.
- J. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.
- K. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
 - 2. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.
 - 3. ICC-ES evaluation report for fastener.
- L. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

3.2 WOOD BLOCKING AND NAILER INSTALLATION

- A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.
- C. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches (38 mm) wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.3 PROTECTION

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

END OF SECTION

SECTION 061600 – GYPSUM SHEATHING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Gypsum sheathing.

B. Related Requirements:

1. Section 061053 "Miscellaneous Rough Carpentry" for plywood backing panels.

1.2 ACTION SUBMITTALS

A. Sustainable Design Submittals: Provide Sustainable Design Submittals in Accordance with Section 018113.

1. Product Disclosure Requirements: To encourage the use of building products that are working to minimize their environmental and health impacts, provide the following information when available:

- a. Environmental Product Declaration: Submit with Product-specific Type III or Industry-wide Type III Environmental Product Declaration (EPD).

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

1.3 DELIVERY, STORAGE, AND HANDLING

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

PART 2 - PRODUCTS

2.1 GYPSUM SHEATHING

- A. Gypsum Sheathing, General: Subject to compliance with requirements, provide one of the following gypsum sheathing products.

- B. Glass-Mat Gypsum Sheathing: ASTM C 1177/1177M.

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

- a. CertainTeed Corporation; GlasRoc.
- b. Georgia-Pacific Building Products; Dens-Glass Gold.
- c. National Gypsum Company; Gold Bond eXP Extended Exposure Sheathing.
- d. United States Gypsum Company; Securock.

2. Type and Thickness: Type X, 5/8 inch (15.9 mm) thick.

3. Size: 48 inches (1219 mm) by maximum length available.

2.2 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
 1. For sheathing, provide fasteners of Type 304 stainless steel.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- D. Screws for Fastening Wood Structural Panels to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.
- E. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing to be attached.
 1. For steel framing from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick, use screws that comply with ASTM C 954.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.
- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.
- C. Securely attach to substrate by fastening as indicated, complying with the following:
 1. "Fastening Schedule," in the ICC's International Building Code.
 2. ICC-ES evaluation report for fastener.
- D. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
- E. 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 cold-formed metal framing with screws.
 2. Install panels with a 3/8-inch (9.5-mm) gap where non-load-bearing construction abuts structural

elements.

3. Install panels with a 1/4-inch (6.4-mm) gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.

- B. Apply fasteners so heads bear tightly against face of sheathing, but do not cut into facing.

END OF SECTION

SECTION 064100 - ARCHITECTURAL CASEWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Architectural casework and other custom-fabricated woodwork, including the following:
 - a. Built-in seat assemblies, including ceiling elements at lobby.
 - b. Wood Cabinetry for Transparent Finish
2. Wood furring, blocking, shims, and hanging strips for installing architectural casework unless concealed within other construction before casework installation.
3. Shop finishing of architectural casework.

B. Related Requirements:

1. Section 057300 "Decorative Metal Railings"
2. Section 061053 "Miscellaneous Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing casework and concealed within other construction before casework installation.
3. Section 092216 "Non-Structural Metal Framing"
4. Section 101100 "Visual Display Units"
5. Section 123661 "Solid-Surfacing Countertops" for solid-surfacing material countertops.

1.2 PREINSTALLATION MEETINGS

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

1.3 ACTION SUBMITTALS

- A. Sustainable Design Submittals: Provide Sustainable Design Submittals in Accordance with Section 018113.
 1. Building Product Disclosure Requirements: To encourage the use of building products that are working to minimize their environmental and health impacts, provide the following information when available:
 - a. Environmental Product Declaration: Submit with Product-specific Type III or Industry-wide Type III Environmental Product Declaration (EPD).

- b. Material Ingredient Reporting: Submit Cradle to Cradle (C2C) certification (v2 Basic or v3 Bronze level), Health Product Declaration (HPD), or Declare product labels.
 - 2. Formaldehyde Emissions Evaluation: Composite wood must be certified as ultra-low-emitting formaldehyde (ULEF) product under EPA Toxic Substances Control Act, Formaldehyde Emission Standards for Composite Wood Products (TSCA, Title VI) (EPA TSCA Title VI) or California Air Resources Board (CARB) Airborne Toxic Control Measure (ATCM). Or be Certified as no added formaldehyde resins (NAF) product under EPA TSCA Title VI or CARB ATCM.
 - B. Product Data: For each type of product, including panel products, cabinet hardware and accessories, and finishing materials and processes.
 - C. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
 - 1. Show details full size.
 - 2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
 - 3. Show locations and sizes of cutouts and holes for electrical switches and outlets and other items installed in architectural casework.
 - 4. For countertops, show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.
 - 5. Show locations and provisions for lighting and electrical systems and other items integrated into architectural casework.
 - D. Samples for Verification:
 - 1. Panel products with shop-applied finish, not less than 12 by 12 inches (300 by 300 mm), with one-half of exposed surface finished.
 - 2. Countertop material, 6 inches (150 mm) square.
 - 3. Exposed cabinet hardware and accessories, one unit for each type and finish.
- 1.4 INFORMATIONAL SUBMITTALS
 - A. Qualification Data: For Installer and fabricator.
- 1.5 QUALITY ASSURANCE
 - A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

- B. Installer Qualifications: An experienced installer who has completed architectural casework similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- C. Fabrication Shop Observation: Before fabricating and installing architectural woodwork, build representative section of reception desk to demonstrate qualities of materials and execution. Use materials and fabrication indicated for the completed Work
 - 1. Notify Architect seven days in advance of dates and times when casework unit will be fabricated.
 - 2. Demonstrate the proposed range of aesthetic effects and workmanship.
 - 3. Obtain Architect's approval of casework unit before proceeding with remaining architectural woodwork fabrication.
 - 4. Approved casework unit may become part of the completed Work if in acceptable condition at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

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

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install casework until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Field Measurements: Where casework 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. Verify dimensions of countertops by field measurements after base cabinets are installed but before countertop fabrication is complete.
 - 2. Locate concealed framing, blocking, and reinforcements that support casework by field measurements before being enclosed, and indicate measurements on Shop Drawings.
- C. Established Dimensions: Where casework is indicated to fit to other construction, establish dimensions for areas where casework is to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.8 COORDINATION

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

PART 2 - PRODUCTS

2.1 ARCHITECTURAL CASEWORK, GENERAL

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

2.2 WOOD CASEWORK FOR TRANSPARENT FINISH

- A. Grade: Custom.
- B. Material for Exposed Surfaces: Exposed plywood panels milled and laminated to configurations indicated.
 - 1. Sand exposed edges of plywood panels and finish as specified to match panel faces.

2.3 CASEWORK MATERIALS

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
 - 1. Wood Moisture Content: 5 to 10 percent.
- B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
 - 1. Softwood Plywood: DOC PS 1.
 - a. Plywood for Countertop Substrates: Exterior softwood plywood complying with DOC PS 1, Grade C-C Plugged, touch sanded.
 - 2. Exposed Plywood Panels: Comply with the following for decorative plywood used in built-in seating, desk assemblies, and ceiling panels:
 - a. Veneer-Faced, Hardwood-Veneer Core Panel Products (Hardwood Plywood): HPVA HP-1, made with adhesive containing no urea formaldehyde.
 - b. Plywood Panels: 13-ply, void-free hardwood veneer-core plywood; BB/BB Grade.
 - c. Thickness: 3/4 inch (19 mm).
 - d. Core Species: Baltic birch.
 - e. Face Species: Maple.
 - f. Pattern: Plain.
 - g. Surface: Smooth.
 - h. Matching of Veneer Leaves: Random match.

2.4 HARDWARE AND ACCESSORIES

- A. General: Provide cabinet hardware and accessory materials associated with architectural casework.

- B. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 170 degrees of opening, self-closing.
 - 1. Product: Grass, Atlas 961, Institutional Hinge
 - C. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081.
 - 1. Product: KV225AL, standard finish
 - D. Shelf Rests: BHMA A156.9, B04013; metal.
 - 1. Product: KV256AL, standard finish
 - E. Drawer Slides: BHMA A156.9.
 - 1. Grade 1HD-100 and Grade 1HD-200: Side mounted; full-overtravel-extension type; zinc-plated-steel ball-bearing slides.
 - F. Door Locks: BHMA A156.11, E07121.
 - 1. Product: National C8053
 - G. Drawer Locks: BHMA A156.11, E07041.
 - 1. Product: National C8053
 - H. Provide locks for all cabinet doors and drawers.
 - I. Door and Drawer Silencers: BHMA A156.16, L03011.
 - J. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.
- 2.5 MISCELLANEOUS MATERIALS
- A. Furring, Blocking, Shims, and Hanging Strips: Fire-retardant-treated softwood lumber, kiln dried to less than 15 percent moisture content.
 - B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.
 - C. Adhesive for Bonding Plastic Laminate: Unpigmented contact cement or resorcinol.
 - 1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.
- 2.6 FABRICATION
- A. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:
 - 1. Corners of Casework: 1/16 inch (1.5 mm) unless otherwise indicated.

- B. Complete fabrication, including assembly, finishing, and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
 - 1. Notify Architect seven days in advance of the dates and times woodwork fabrication will be complete.
 - 2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements before disassembling for shipment.
- C. 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.
- D. Install glass to comply with applicable requirements in Section 088000 "Glazing" and in GANA's "Glazing Manual." For glass in wood frames, secure glass with removable stops.

2.7 SHOP FINISHING

- A. General: Finish architectural casework at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.
- B. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural casework, as applicable to each unit of work.
 - 1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of casework.
- C. Transparent Finish
 - 1. Grade: Premium.
 - 2. Finish: One of the following:
 - a. System - 4, water-based latex acrylic.
 - b. System - 5, conversion varnish.
 - c. System - 7, catalyzed vinyl.
 - d. System - 10, water-based UV curable.
 - 3. Staining: None required.
 - 4. Open Finish: Do not apply filler to open-grain woods.
 - 5. Sheen: Satin, 31-45 gloss units measured on 60-degree gloss meter per ASTM D 523.

PART 3 - EXECUTION

3.1 PREPARATION

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

3.2 INSTALLATION

- A. Grade: Install casework to comply with same grade as item to be installed.
- B. Assemble casework and complete fabrication at Project site to the extent that it was not completed in the shop.
- C. Install casework level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm).
- D. Scribe and cut casework to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- E. Anchor casework to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork.
 - 1. For shop finished items use filler matching finish of items being installed.
- F. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
 - 1. Install cabinets with no more than 1/8 inch in 96-inch (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, and at ends not more than 16 inches (400 mm) o.c. with No. 10 wafer-head screws sized for not less than 1-1/2-inch (38-mm) penetration into wood framing, blocking, or hanging strips; or No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish.
- G. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
 - 1. For solid-surface-material countertops, pre-drill holes for screws as recommended by manufacturer.
 - 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. Seal junctures of tops, splashes, and walls with mildew-resistant silicone sealant or another permanently elastic sealing compound recommended by countertop material manufacturer.

H. Touch up finishing work specified in this Section after installation of woodwork. Fill nail holes with matching filler where exposed.

1. Apply specified finish coats, including stains and paste fillers if any, to exposed surfaces where only sealer/prime coats are applied in shop.

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective casework, 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 casework on exposed and semi-exposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION

SECTION 071326 - SELF-ADHERING SHEET WATERPROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Modified bituminous sheet waterproofing for foundation walls protecting ground floor slab below grade or other locations indicated on Drawings.
2. Repair mortar to prepare surfaces for waterproofing

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review waterproofing requirements including surface preparation, substrate condition and pretreatment, minimum curing period, forecasted weather conditions, special details and sheet flashings, installation procedures, testing and inspection procedures, and protection and repairs.

1.3 ACTION SUBMITTALS

A. Sustainable Design Submittals: Provide Sustainable Design Submittals in Accordance with Section 018113.

1. Building Product Disclosure Requirements: To encourage the use of building products that are working to minimize their environmental and health impacts, provide the following information when available:
 - a. Environmental Product Declaration: Submit with Product-specific Type III or Industry-wide Type III Environmental Product Declaration (EPD).
 - b. Material Ingredient Reporting: Submit Cradle to Cradle (C2C) certification (v2 Basic or v3 Bronze level), Health Product Declaration (HPD), or Declare product labels.
2. General Emissions Evaluation: Adhesives and Sealants must be tested and determined compliant in accordance with California Department of Public Health (CDPH) Standard Method v1.2-2017, using the applicable exposure scenario.

B. Product Data: For each type of product.

1. Include construction details, material descriptions, and tested physical and performance properties of waterproofing.
2. Include manufacturer's written instructions for evaluating, preparing, and treating substrate.

C. Shop Drawings: Show locations and extent of waterproofing and details of substrate joints and cracks, expansion joints, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, and other termination conditions.

1. Include setting drawings showing layout, sizes, sections, profiles, and joint details of pedestal-supported concrete pavers.

D. Samples: For each exposed product and for each color and texture specified, including the following products:

1. 8-by-8-inch square of waterproofing and flashing sheet.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Field quality-control reports.
- C. Sample Warranties: For special warranties.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by waterproofing manufacturer.
- B. Mockups: Build mockups to verify selections made under Sample submittals and to set quality standards for installation.
 1. Build for each typical waterproofing installation including accessories to demonstrate surface preparation, crack and joint treatments, inside and outside corner treatments, and protection.
 - a. Size: 100 sq. ft. in area.
 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 FIELD CONDITIONS

- A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended in writing by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate.
 1. Do not apply waterproofing in snow, rain, fog, or mist.
- B. Maintain adequate ventilation during preparation and application of waterproofing materials.

1.7 WARRANTY

- A. Manufacturer's Warranty:
 1. Waterproofing Warranty: Manufacturer agrees to furnish replacement waterproofing material for waterproofing that does not comply with requirements or that fails to remain watertight within specified warranty period.
 - a. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations for Waterproofing System: Obtain waterproofing materials from single source from single manufacturer.

2.2 MODIFIED BITUMINOUS SHEET WATERPROOFING

- A. Modified Bituminous Sheet Waterproofing: Minimum 60-mil nominal thickness, self-adhering sheet consisting of 56 mils of rubberized asphalt laminated on one side to a 4-mil-thick, polyethylene-film reinforcement, and with release liner on adhesive side; formulated for application with primer or surface conditioner that complies with VOC limits of authorities having jurisdiction.
 - a. Basis-of-Design Product: Subject to compliance with requirements, provide GCP Advanced Technologies Bituthene Sheet Applied waterproofing system
- 2. Physical Properties:
 - a. Tensile Strength, Membrane: 325 psi minimum; ASTM D412, Die C, modified.
 - b. Ultimate Elongation: 300 percent minimum; ASTM D412, Die C, modified.
 - c. Low-Temperature Flexibility: Pass at minus 20 deg F; ASTM D1970/D1970M.
 - d. Crack Cycling: Unaffected after 100 cycles of 1/8-inch movement; ASTM C836/C836M.
 - e. Puncture Resistance: 50 lbf minimum; ASTM E154/E154M.
 - f. Water Absorption: 0.1 percent weight-gain maximum after 48-hour immersion at 70 deg F; ASTM D570.
 - g. Water Vapor Permeance: 0.02 perm maximum; ASTM E96/E96M, Water Method.
 - h. Hydrostatic-Head Resistance: 231feet minimum; ASTM D5385.

2.3 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: Liquid primer recommended for substrate by sheet waterproofing material manufacturer.
- C. Repair Mortar: Two-component, polymer modified, Portland cement based, non-sag mortar formulated for patching concrete and masonry surfaces.
 - 1. Product: SikaTop -123 Plus
- D. Surface Conditioner: Liquid, waterborne surface conditioner recommended for substrate by sheet waterproofing material manufacturer.
- E. Liquid Membrane: Elastomeric, two-component liquid, cold fluid applied, of trowel grade or low viscosity.
- F. Substrate Patching Membrane: Low-viscosity, two-component, modified asphalt coating.
- G. Metal Termination Bars: Aluminum bars, approximately 1 by 1/8 inch, predrilled at 9-inch centers.

2.4 MOLDED-SHEET DRAINAGE PANELS

- A. Non-woven Geotextile Faced, molded-sheet drainage panel
 - 1. Product: Hydroduct 660

2.5 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of waterproofing.
 - 1. Verify that concrete has cured and aged for minimum time period recommended in writing by waterproofing manufacturer.
 - 2. Verify that substrate is visibly dry and within the moisture limits recommended in writing by manufacturer. Test for capillary moisture by plastic sheet method according to ASTM D4263.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

2.6 PREPARATION

- A. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for waterproofing application.
- B. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.
- C. Remove fins, ridges, mortar, and other projections.
- D. Fill form tie holes, honeycomb, aggregate pockets, holes, and other voids.
- E. Prepare, fill, prime, and treat joints and cracks in substrates. Remove dust and dirt from joints and cracks according to ASTM D4258.
- F. Corners: Prepare, prime, and treat inside and outside corners in accordance with manufacturer's instructions and ASTM D 6135.
- G. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through waterproofing and at drains and protrusions.

2.7 INSTALLATION OF MODIFIED BITUMINOUS SHEET WATERPROOFING

- A. Install modified bituminous sheets according to waterproofing manufacturer's written instructions.
- B. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by sheet waterproofing in same day. Reprime areas exposed for more than 24 hours.
- C. Apply and firmly adhere sheets over area to receive waterproofing. Accurately align sheets and maintain uniform 2-1/2-inch-minimum lap widths and end laps. Overlap and seal seams, and stagger end laps to ensure watertight installation.
 - 1. When ambient and substrate temperatures range between 25 and 40 deg F, install self-adhering, modified bituminous sheets produced for low-temperature application. Do not use low-temperature sheets if ambient or substrate temperature is higher than 60 deg F.
- D. Apply continuous sheets over already-installed sheet strips, bridging substrate cracks, construction, and contraction joints.
- E. Seal edges of sheet waterproofing terminations with mastic.

- F. Install sheet waterproofing and auxiliary materials to tie into adjacent waterproofing.
- G. Repair tears, voids, and lapped seams in waterproofing not complying with requirements. Slit and flatten fishmouths and blisters. Patch with sheet waterproofing extending 6 inches beyond repaired areas in all directions.
- H. Immediately install protection course with butted joints over waterproofing membrane.
 - 1. Insulation drainage panels may be used in place of a separate protection course to vertical applications when approved by waterproofing manufacturer and installed immediately.
- I. Installation at rubble stone foundation wall:
 - 1. Remove dirt and loose mortar from the exterior of existing wall
 - 2. Power wash work area
 - 3. Remove any large protrusions and fill any deep voids with mortar
 - 4. Parge wall flush with smooth trowel finish
 - 5. Apply primer to substrates, continuous membrane sheets, auxiliary materials, and protection course as described in previous sections.

2.8 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a site representative qualified by waterproofing membrane manufacturer to inspect substrate conditions, surface preparation, membrane application, flashings, protection, and drainage components; and to furnish daily reports to Architect.

2.9 PROTECTION, REPAIR, AND CLEANING

- A. Do not permit foot or vehicular traffic on unprotected membrane.
- B. Protect waterproofing from damage and wear during remainder of construction period.
- C. Protect installed insulation drainage panels from damage due to UV light, harmful weather exposures, physical abuse, and other causes. Provide temporary coverings where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.
- D. Correct deficiencies in or remove waterproofing that does not comply with requirements; repair substrates, reapply waterproofing, and repair sheet flashings.
- E. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended in writing by manufacturer of affected construction.

END OF SECTION

SECTION 071616 - CRYSTALLINE WATERPROOFING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Crystalline waterproofing for negative-side application to concrete.
- B. Apply crystalline waterproofing to the following surfaces:
 - 1. Inside faces of elevator pit walls and floors.
 - 2. Other locations as indicated.
- C. Related Requirements:
 - 1. Section 033000 "Cast-in-Place Concrete" for concrete slabs serving as protective topping for waterproofing and the finishing of concrete walls and slabs to receive waterproofing.

1.2 PREINSTALLATION MEETINGS

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

1.3 ACTION SUBMITTALS

- A. Sustainable Design Submittals: Provide Sustainable Design Submittals in Accordance with Section 018113.
 - 1. Building Product Disclosure Requirements: To encourage the use of building products that are working to minimize their environmental and health impacts, provide the following information when available:
 - a. Environmental Product Declaration: Submit with Product-specific Type III or Industry-wide Type III Environmental Product Declaration (EPD).
 - b. Material Ingredient Reporting: Submit Cradle to Cradle (C2C) certification (v2 Basic or v3 Bronze level), Health Product Declaration (HPD), or Declare product labels.
 - 2. General Emissions Evaluation: Adhesives and Sealants must be tested and determined compliant in accordance with California Department of Public Health (CDPH) Standard Method v1.2-2017, using the applicable exposure scenario.

- B. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, and installation instructions.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Applicator.
- B. Product Certificates: For each type of waterproofing, patching, and plugging material.
- C. Product Test Reports: For each product formulation, for tests performed by manufacturer and witnessed by a qualified testing agency.
- D. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Applicator Qualifications: A firm experienced in applying crystalline waterproofing similar in material, design, and extent to that indicated for this Project, whose work has resulted in applications with a record of successful in-service performance, and that employs workers trained and approved by manufacturer.

1.6 FIELD CONDITIONS

- A. Weather Limitations: Proceed with application only when existing and forecasted weather conditions permit crystalline waterproofing to be performed according to manufacturer's written instructions.
- B. Proceed with waterproofing work only after pipe sleeves, vents, curbs, inserts, drains, and other projections through the substrate to be waterproofed have been completed. Proceed only after substrate defects, including honeycombs, voids, and cracks, have been repaired to provide a sound substrate free of forming materials, including reveal inserts.
- C. Ambient Conditions: Proceed with waterproofing work only if temperature is maintained at 40 deg F (4.4 deg C) or above during work and cure period, and space is well ventilated and kept free of water.

PART 2 - PRODUCTS

2.1 WATERPROOFING MATERIALS

- A. Crystalline Waterproofing: Prepackaged, proprietary blend of portland cement, specially treated sand, and active chemicals that, when mixed with water and applied, penetrates into concrete and concrete unit masonry and reacts chemically with the byproducts of cement hydration in the presence of water to develop crystalline growth within substrate capillaries to produce an impervious, dense, waterproof substrate; with properties complying with or exceeding the criteria specified below.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. AQUAFIN, Inc.; AQUAFIN-1C.
 - b. BASF Building Systems; Tegraproof.
 - c. Tremco Incorporated, an RPM company; Permaquik Crystalline Waterproofing.
 - d. Xypex Chemical Corporation; Xypex Concentrate with Xypex Modified.
 - 2. Water Permeability: Maximum zero for water at 30 feet (9 m) when tested according to COE CRD-C 48.
 - 3. Compressive Strength: Minimum 4000 psi (27.6 MPa) at 28 days when tested according to ASTM C 109/C 109M.

2.2 ACCESSORY MATERIALS

- A. Patching Compound: Factory-premixed cementitious repair mortar, crack filler, or sealant recommended by waterproofing manufacturer for filling and patching tie holes, honeycombs, reveals, and other imperfections; and compatible with substrate and other materials indicated.
- B. Plugging Compound: Factory-premixed cementitious compound with hydrophobic properties and recommended by waterproofing manufacturer; resistant to water and moisture but vapor permeable for all standard applications (vertical, overhead, and horizontal surfaces not exposed to vehicular traffic); and compatible with substrate and other materials indicated.
- C. Water: Potable.

2.3 MIXES

- A. Crystalline Waterproofing: Add prepackaged dry ingredients to water according to manufacturer's written instructions. Mix together with mechanical mixer or by hand to required consistency.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Applicator present, for suitable conditions where waterproofing is to be applied.
- B. Proceed with application only after unsatisfactory conditions have been corrected.
- C. Notify Architect in writing of active leaks or defects that would affect system performance.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions.
- B. Protect other work from damage caused by cleaning, preparation, and application of waterproofing. Provide temporary enclosure to confine spraying operation and to ensure adequate ambient temperatures and ventilation conditions for application.
- C. Do not allow waterproofing, patching, and plugging materials to enter reveals or annular spaces intended for resilient sealants or gaskets, such as joint spaces between pipes and pipe sleeves.
- D. Stop active water leaks with plugging compound.
- E. Repair damaged or unsatisfactory substrate with patching compound.
 - 1. At holes and cracks 1/16 inch (1.6 mm) wide or larger in substrate, remove loosened chips and cut reveal with sides perpendicular to surface, not tapered, and minimum 1 inch (25 mm) deep. Fill reveal with patching compound flush with surface.
- F. Surface Preparation: Remove efflorescence, chalk, dust, dirt, mortar spatter, grease, oils, paint, curing compounds, and form-release agents to ensure that waterproofing bonds to surfaces.
 - 1. Clean concrete surfaces according to ASTM D 4258.
 - a. Scratch- and Float-Finished Concrete: Etch with 10 percent muriatic acid solution according to ASTM D 4260.
 - b. Smooth-Formed and Trowel-Finished Concrete: Prepare by mechanical abrading or abrasive-blast cleaning according to ASTM D 4259.
 - 2. Concrete Joints: Clean reveals.

3.3 APPLICATION

- A. General: Comply with waterproofing manufacturer's written instructions for application and curing.
 - 1. Saturate surface with water for several hours and maintain damp condition until applying waterproofing. Remove standing water.
 - 2. Apply waterproofing to surfaces, and extend waterproofing onto adjacent surfaces as follows:

- a. Onto every substrate in areas indicated for treatment, including pipe trenches, pipe chases, pits, sumps, and similar offsets and features.
 3. Number of Coats: Number recommended by manufacturer for specified water permeability, but not less than two.
 4. Application Method: Apply to ensure that each coat fills voids and is in full contact with substrate or previous coat.
 5. Dampen surface between coats.
- B. Final Coat Finish: As selected by Architect from manufacturer's full range.
 - C. Curing: Moist-cure waterproofing for three days immediately after final coat has set, followed by air drying, unless otherwise recommended in writing by manufacturer.
- 3.4 FIELD QUALITY CONTROL
- A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect completed application of waterproofing.
 - B. Prepare test and inspection reports.

END OF SECTION

SECTION 071900 - WATER REPELLENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Penetrating water-repellent and graffiti control treatments for the following vertical surfaces:
 - 1. Exterior Concrete Masonry Units (CMUs)

1.2 PRECONSTRUCTION TESTING

- A. Preconstruction Testing: Installed water repellents shall comply with performance requirements indicated, as evidenced by reports of tests performed on manufacturer's standard substrate assemblies by a qualified testing agency.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
 - 1. Include manufacturer's printed statement of VOC content.
 - 2. Include manufacturer's recommended number of coats for each type of substrate and spreading rate for each separate coat.
- B. Samples: For each type of water repellent and substrate indicated, 12 by 12 inches (300 by 300 mm) in size, with specified water-repellent treatment applied to half of each Sample.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Applicator.
- B. Product Certificates: For each type of water repellent, from manufacturer.
- C. Warranty: Special warranty specified in this Section.

1.5 QUALITY ASSURANCE

- A. Applicator Qualifications: An employer of workers trained and approved by manufacturer.
- B. Mockups: Apply water repellent to each type of substrate required.
 - 1. Locate each test application as directed by Architect.
 - 2. Size: 20 sq. ft. (9.3 sq. m).
 - 3. Final approval by Architect of water-repellent application will be from test applications.
- C. Preinstallation Conference: Conduct conference at Project site.

1.6 PROJECT CONDITIONS

- A. Limitations: Proceed with application only when the following existing and forecasted weather and substrate conditions permit water repellents to be applied according to manufacturers' written instructions and warranty requirements:
 - 1. Concrete surfaces have cured for not less than 28 days.
 - 2. Building has been closed in for not less than 30 days before treating wall assemblies.

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

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer and Applicator agree to repair or replace materials that fail to maintain water repellency specified in "Performance Requirements" Article within specified warranty period.

1. Warranty Period: 2 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PENETRATING WATER REPELLENTS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Prosoco, Inc. Sure Klean® Weather Seal Blok-Guard® & Graffiti Control WB 6 or comparable products by one of the following:
 1. Dayton Superior Corporation.
 2. Degussa Corp.
 3. Pecora Corporation.
 4. BASF, Inc.
 5. Tnemec Inc.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements and conditions affecting performance of the Work.
 1. Verify that surfaces are clean and dry according to water-repellent manufacturer's requirements. Check moisture content in three representative locations by method recommended by manufacturer.
 2. Inspect for previously applied treatments that may inhibit penetration or performance of water repellents.
 3. Verify that there is no efflorescence or other removable residues that would be trapped beneath the application of water repellent.
 4. Verify that required repairs are complete, cured, and dry before applying water repellent.
- B. Test pH level according to water-repellent manufacturer's written instructions to ensure chemical bond to silica-containing or siliceous minerals.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Cleaning: Before application of water repellent, clean substrate of substances that could impair penetration or performance of product according to water-repellent manufacturer's written instructions and as follows:

1. Concrete Masonry Units: Remove oil, curing compounds, laitance, and other substances that inhibit penetration or performance of water repellents according to ASTM E 1857.
- B. Protect adjoining work, including mortar and sealant bond surfaces, from spillage or blow-over of water repellent. Cover adjoining and nearby surfaces of aluminum and glass if there is the possibility of water repellent being deposited on surfaces. Cover live vegetation.
- C. Coordination with Sealant Joints: Do not apply water repellent until sealants for joints adjacent to surfaces receiving water-repellent treatment have been installed and cured.
 1. Water-repellent work may precede sealant application only if sealant adhesion and compatibility have been tested and verified using substrate, water repellent, and sealant materials identical to those required.

3.3 APPLICATION

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect the substrate before application of water repellent and to instruct Applicator on the product and application method to be used.
- B. Apply a heavy-saturation coating of water repellent, on surfaces indicated for treatment, using 15 psi- (103 kPa-) pressure spray with a fan-type spray nozzle to the point of saturation. Apply coating in dual passes of uniform, overlapping strokes. Remove excess material; do not allow material to puddle beyond saturation. Comply with manufacturer's written instructions for application procedure unless otherwise indicated.
 1. Spray
 - a. Using low-pressure (less than 50 psi) spray equipment, saturate, "wet-on-wet" spraying from the bottom up. Avoid excessive overlapping.
For textured and porous surfaces, apply enough material to create 6-to-8 inch rundown below the contact point.
 - b. Let first application penetrate masonry surface for 2 to 3 minutes.
For textured and porous surfaces, reapply in same saturating manner to ensure complete coverage of recessed surfaces.
 - c. Immediately brush out runs and drips to prevent build up.
 2. Brush or Roller
 - a. Saturate uniformly. Let product penetrate for 2 to 3 minutes. Re-saturate. Brush out heavy runs and drips that don't penetrate.
 3. Dense, Smooth Surface Application Instructions
 - a. Apply enough in a single saturating application to completely wet the surface without creating drips, puddles or rundown. Brush out or back roll all runs and drips for uniform appearance. Do not over apply. Over application may cause unacceptable color change. One application is normally enough. Always test for application rate.
- C. Second Coat/Porous Surface Application Instructions
 1. Some surfaces will need an additional coat for maximum protection. Apply the second wet-on-wet coat as soon as the first application is dry to the touch or within one hour. Immediately back roll or brush out runs and drips for a uniform appearance and to prevent build up. Allowing more than one hour between coats could reduce the effectiveness of the second coat or cause darkening.

3.4 FIELD QUALITY CONTROL

- A. Testing of Water-Repellent Material: Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when water repellent is being applied:
 - 1. Owner will engage the services of a qualified testing agency to sample water-repellent material being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.
 - 2. Testing agency will perform tests for compliance of water-repellent material with product requirements.
 - 3. Owner may direct Contractor to stop applying water repellents if test results show material being used does not comply with product requirements. Contractor shall remove noncomplying material from Project site, pay for testing, and correct deficiency of surfaces treated with rejected materials, as approved by Architect.

- B. Coverage Test: In the presence of Architect, hose down a dry, repellent-treated surface to verify complete and uniform product application. A change in surface color will indicate incomplete application.
 - 1. Notify Architect seven days in advance of the dates and times when surfaces will be tested.
 - 2. Reapply water repellent until coverage test indicates complete coverage.

3.5 CLEANING

- A. Immediately clean water repellent from adjoining surfaces and surfaces soiled or damaged by water-repellent application as work progresses. Correct damage to work of other trades caused by water-repellent application, as approved by Architect.

- B. Comply with manufacturer's written cleaning instructions.

END OF SECTION

SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Extruded polystyrene foam-plastic board.
2. Glass-Fiber Blanket insulation
3. Mineral-wool board insulation
4. Closed-cell spray polyurethane foam

B. Related Requirements:

1. Section 075216 "SBS Modified Bituminous Membrane Roofing" for insulation specified as part of roofing construction.
2. Section 074113 "Stone Coated Metal Roofing Panels" for insulation specified as part of roofing construction.
3. Section 092900 "Gypsum Board" for sound attenuation blanket used as acoustic insulation.

1.2 ACTION SUBMITTALS

A. Sustainable Design Submittals: Provide Sustainable Design Submittals in Accordance with Section 018113.

1. Building Product Disclosure Requirements: To encourage the use of building products that are working to minimize their environmental and health impacts, provide the following information when available:
 - a. Environmental Product Declaration: Submit with Product-specific Type III or Industry-wide Type III Environmental Product Declaration (EPD).
 - b. Material Ingredient Reporting: Submit Cradle to Cradle (C2C) certification (v2 Basic or v3 Bronze level), Health Product Declaration (HPD), or Declare product labels.
2. General Emissions Evaluation: Paints and Coatings must be tested and determined compliant in accordance with California Department of Public Health (CDPH) Standard Method v1.2-2017, using the applicable exposure scenario.
3. Recycled Content: The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.
4. Regional Materials: Materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles (160 km) of Project Site. If only a fraction of a product or material is extracted/harvested/recovered and manufactured locally, then only that percentage (by weight) shall contribute to the regional value.

B. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

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

- B. Evaluation Reports: For foam-plastic insulation, from ICC-ES.

1.4 DELIVERY, STORAGE, AND HANDLING

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

PART 2 - PRODUCTS

2.1 EXTRUDED POLYSTYRENE FOAM-PLASTIC BOARD

- A. Extruded polystyrene boards in this article are also called "XPS boards." Roman numeral designators in ASTM C 578 are assigned in a fixed random sequence, and their numeric order does not reflect increasing strength or other characteristics.
- B. Extruded Polystyrene Board, Type IV: ASTM C 578, Type IV, 25-psi (173-kPa) minimum compressive strength; unfaced; maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E 84.
 - 1. Basis-of-Design: Subject to compliance with requirements, provide products by one of the following:
 - a. Dupont Reduced GWP Styrofoam
 - b. Kingspan GreenGuard XPS LG
 - c. Owens Corning Foamular NxG

2.2 GLASS-FIBER BLANKET

- A. Formaldehyde-Free Glass-Fiber Blanket, Encapsulated: ASTM C 665, Type II, Class A, Category 2; encapsulated in plastic facing that is not a vapor retarder; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide products by one of the following:
 - a. Johns Manville; ComfortTherm, JM Formaldehyde-free™.
 - b. Certaineed Fiberglass Building Insulation
 - c. Knauf EcoBatt, Jet Stream and Jet Spray
 - d. Owens Corning Unfaced EcoTouch PINK

2.3 MINERAL-WOOL BOARD

- A. Mineral-Wool Board, Type IVB, Unfaced: ASTM C 612, Type IV B; with maximum flame-spread and smoke-developed indexes of zero and zero, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
 - 1. Basis-of-Design Product: Roxul Inc.; CavityRock DD.
 - 2. Nominal density of outer layer 6.2 lb/cu. ft. (100 kg/cu. m), thermal resistivity of 4.3 deg F x h x sq. ft./Btu x in. at 75 deg F (29.8 K x m/W at 24 deg C).

2.4 CLOSED-CELL SPRAY POLYURETHANE FOAM

- A. Closed-Cell Spray Polyurethane Foam: ASTM C 1029 Type II minimum density of 1.5lb/cu. Ft. and minimum R-value at 1 inch thickness of 6.2 deg F x h x sq. ft/ Btu at 75 deg F.
 - 1. Basis of Design: Subject to compliance with requirements, provide products by one of the following:
 - a. Carlisle Syntec Seal-Tite Pro One Zero
 - b. Demilec HEATLOK SOY 200 PLUS
 - 2. Primer: Material recommended by insulation manufacturer where required for adhesion of insulation to substrates
 - 3. Thermal Barrier Coating: Fire-protective intumescent coating formulated for application over polyurethane foam plastics, compatible with insulation, and passes NFPA 275 testing as part of an approved assembly.
 - a. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - b. Flame-Spread Index: 25 or less.
 - c. Smoke-Developed Index: 50 or less.
 - d. Topcoat: 8- to 12-mil thick, heavy -duty protective coating recommended in writing by intumescent thermal barrier manufacturer as compatible with substrate materials.

2.5 INSULATION FASTENERS

- A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position with self-locking washer in place.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. AGM Industries, Inc; Series T TACTOO Insul-Hangers.
 - b. Gemco; Spindle Type.
 - 2. Plate: Perforated, stainless-steel sheet, 0.030 inch (0.762 mm) thick by 2 inches (50 mm) square.
 - 3. Spindle: stainless-steel; fully annealed; 0.105 inch (2.67 mm) in diameter; length to suit depth of insulation.
- B. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- (0.41-mm-) thick galvanized-steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches (38 mm) square or in diameter.
- C. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates without damaging insulation, fasteners, or substrates.

2.6 ACCESSORIES

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

PART 3 - EXECUTION

3.1 PREPARATION

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

3.2 INSTALLATION, GENERAL

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

3.3 INSTALLATION OF SLAB INSULATION

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

3.4 INSTALLATION OF FOUNDATION WALL INSULATION

- A. Butt panels together for tight fit.
- B. Adhesive Installation: Install with adhesive or press into tacky waterproofing according to manufacturer's written instructions.

3.5 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

- A. Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
 - 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
 - 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
 - 3. Maintain 3-inch (76-mm) clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
 - 4. For metal-framed wall cavities where cavity heights exceed 96 inches (2438 mm), support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.

- B. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
 - 1. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.

3.6 INSTALLATION OF INSULATION IN CEILINGS FOR SOUND ATTENUATION

- A. Where glass-fiber blankets are indicated for sound attenuation above ceilings, install blanket insulation over entire ceiling area in thicknesses indicated. Extend insulation 48 inches up either side of partition unless otherwise noted.

3.7 INSTALLATION OF CLOSED-CELL SPRAY POLYURETHANE FOAM

- A. Comply with insulation manufacturer's written instructions applicable to products and applications
- B. Spray insulation to envelop entire area to be insulated and fill voids
- C. Apply in multiple passes to not exceed maximum thicknesses recommended by manufacturer. Do not spray into rising foam.
- D. At existing roof locations, use appropriate methods to stop spray foam insulation 12" away from any existing wood building structure embedded in masonry load bearing walls

3.8 PROTECTION

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

END OF SECTION

SECTION 072727 – SELF-ADHERED SHEET MEMBRANE AIR BARRIERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Materials and installation methods for self-adhered vapor permeable air 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, adjacent existing conditions, piping and other penetrations through the wall assembly.

B. Related Requirements:

1. Section 044315 “Anchored Stone Masonry Veneer”
2. Section 042200 “Concrete Unit Masonry”
3. Section 074213 “Metal Wall Panels” for metal panels installed over air barriers.
4. Section 084523 “Insulated Translucent Fiberglass Sandwich Panel Wall Systems”
5. Section 084413 “Glazed Aluminum Curtain Walls”

1.2 DEFINITIONS

- A. Air-Barrier Material:** A primary element that provides a continuous barrier to the movement of air.
- B. Air-Barrier Accessory:** A transitional component of the air barrier that provides continuity.
- C. Air-Barrier Assembly:** The collection of air-barrier materials and accessory materials applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site

1. Review air-barrier requirements and installation, special details, mockups, air-leakage and bond testing, air-barrier protection, and work scheduling that covers air barriers.

1.4 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.

1. ASTM C920 Specifications for Elastomeric Joint Sealants
2. ASTM D412 Standard Test Methods for Rubber Properties in Tension
3. ASTM D570 Test Method for Water Absorption of Plastic
4. ASTM D903 Standard Test Method for Peel or Stripping Strength of Adhesive Bonds
5. ASTM D1004 Test Method for Initial Tear Resistance of Plastic Film and Sheeting
6. ASTM D1876 Test Method for Peel Resistance of Adhesives
7. ASTM D1938 Test Method for Tear Propagation Resistance of Plastic Film and Sheeting

8. ASTM D1970 Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection
9. ASTM D4263 Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method
10. ASTM D4541 Test Method for Pull-off Strength of Coatings Using Portable Adhesion Testers
11. ASTM D5034 Test Method for Breaking Strength and Elongation of Textile Fabrics
12. ASTM E96 Test Methods for Water Vapor Transmission of Materials
13. ASTM E154 Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover
14. ASTM E1186 Practice for Air Leakage Site Detection in Building Envelopes and Air Retarder Systems
15. ASTM E2178 Standard Test Method for Air Permeance of Building Materials
16. ASTM E2357 Standard Test Method for Determining Air Leakage of Air Barrier Assemblies
17. AATCC-127 Water Resistance: Hydrostatic Pressure Test (American Association of Textile Chemists and Colorists)

1.5 ACTION SUBMITTALS

- A. Sustainable Design Submittals: Provide Sustainable Design Submittals in Accordance with Section 018113.
 1. General Emissions Evaluation: Adhesives and Sealants must be tested and determined compliant in accordance with California Department of Public Health (CDPH) Standard Method v1.2-2017, using the applicable exposure scenario. Show compliance with VOC limits as detailed in Section 018113 "VOC Limits". VOC Content Requirement for Wet Applied Products: All adhesives and sealants wet-applied on site must meet the applicable VOC limits of the South Coast Air Quality Management District (SCAQMD) Rule 1168, effective October 6, 2017.
- B. Product Data: For each type of product.
 1. Include manufacturer's written instructions for evaluating, preparing, and treating substrate; technical data; and tested physical and performance properties of products.
- C. Shop Drawings: For air-barrier assemblies.
 1. Show locations and extent of air barrier. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
 2. Include details of interfaces with other materials that form part of air barrier.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer. Include list of ABAA-certified installers and supervisors employed by the Installer, who work on Project.
- B. Product Certificates: From air-barrier manufacturer, certifying compatibility of air barriers and accessory materials with Project materials that connect to or that come in contact with air barrier.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for air barriers, submit certified test report showing compliance with requirements specified for ASTM E2178.
- D. Samples: Submit clearly labeled samples, 3 by 4 inch (75 mm by 100 mm) minimum size of each material specified.

- E. Compatibility: Submit letter from manufacturer stating that materials proposed for use are permanently chemically compatible and adhesively compatible with adjacent materials proposed for use. Submit letter from manufacturer stating that cleaning materials used during installation are chemically compatible with adjacent materials proposed for use.
- F. Hazardous Materials Notification: In the event no product or material is available that does not contain asbestos, PCB or other hazardous materials as determined by the Owner, a "Material Safety Data Sheet" (MSDS) equivalent to OSHA Form 20 shall be submitted for that proposed product or material prior to installation.
- G. Asbestos and PCB Certification: After completion of installation, but prior to Substantial Completion, Contractor shall certify in writing that products and materials installed, and processes used, do not contain asbestos or polychlorinated biphenyls (PCB).

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer. The work of this section shall be performed by a company which specializes in the type sheet-applied membrane air barriers work required for this Project, with a minimum of 15 years of documented successful experience and shall be performed by skilled workmen thoroughly experienced in the necessary crafts
 - 1. Installer shall be licensed by ABAA according to ABAA's Quality Assurance Program and shall employ ABAA-certified installers and supervisors on Project.
- B. Mockups: Build mockups to set quality standards for materials and execution.
 - 1. Build integrated mockups of exterior wall assembly as shown on Drawings incorporating backup wall construction, external cladding, window, storefront, door frame and sill, insulation, ties and other penetrations, and flashing to demonstrate surface preparation, crack and joint treatment, application of air barriers, and sealing of gaps, terminations, and penetrations of air-barrier assembly.
 - a. Coordinate construction of mockups to permit inspection by Owner's testing agency of air barrier before external insulation and cladding are installed.
 - b. Include junction with roofing membrane, building corner condition, and existing adjacent conditions.
 - c. If Architect determines mockups do not comply with requirements, reconstruct mockups and apply air barrier until mockups are approved.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Remove and replace liquid materials that cannot be applied within their stated shelf life.
- B. Protect stored materials from direct sunlight.

1.9 FIELD CONDITIONS

- A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended by air-barrier manufacturer.
 - 1. Protect substrates from environmental conditions that affect air-barrier performance.
 - 2. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.
- B. Temperature: Provide air barrier recommended by air barrier manufacturer suitable for service in the range of ambient and surface temperatures that can occur at the project site.

1.10 WARRANTY

- A. Submit manufacturer's warranty that air barrier and accessories are free of defects at time of delivery and are manufactured to meet manufacturer's published physical properties and material specifications.
- B. Warranty Period: Five years from date of completion of the air barrier membrane installation.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Source Limitations: Obtain primary air-barrier materials and air-barrier accessories from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. General: Air barrier shall be capable of performing as a continuous air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air-barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, tie-ins to installed waterproofing, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.
- B. Air-Barrier Assembly Air Leakage: Maximum 0.04 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft. (0.2 L/s x sq. m of surface area at 75 Pa) when tested according to ASTM E 283 ASTM E 2357.
- C. Connections to Adjacent Materials: Provide connections to prevent air and water leakage and vapor migration at the following locations:
 - 1. Foundation and walls, including penetrations, ties and anchors.
 - 2. Walls, windows, curtain walls, storefronts, louvers or doors.
 - 3. Different wall assemblies and fixed openings within those assemblies.
 - 4. Wall and roof connections.
 - 5. Floors over unconditioned space.
 - 6. Walls, floor and roof across construction, control and expansion joints.
 - 7. Walls, floors and roof to utility, pipe and duct penetrations.
 - 8. Seismic and expansion joints.
 - 9. All other leakage pathways in the building envelope.
- D. Air Barrier Assembly Water Infiltration: Provide air barrier systems that do not evidence water leakage at a pressure difference of 15 psf when tested according to ASTM E331.

1. Definition of Uncontrolled Water Penetration and Test Specimen Failure shall be as published by ASTM with the following additions:
 - a. There shall be no water penetration inboard of the air barrier plane and the assembly shall provide rapid drainage resulting in no retained water in cavities outboard of the air barrier. There shall be no uncontrolled water infiltrating system or migration of water into the concealed spaces of any exterior wall cavity not intended to function as a “wet zone” in the design of the above-grade building envelope. Water controlled by flashing and gutters that is drained back to the exterior and cannot damage adjacent materials and finishes is not considered water leakage.
 - b. Air barrier systems shall be designed, fabricated and installed with the necessary provisions required to drain accumulated rainwater or condensation inside the system to the building exterior. Provide accessories required to complete the concealed drainage system including but not limited to flashings, weeps seals, dams, tubes, sealants and diverters. Provide baffles as required to prevent the ingress of wind driven water.

2.3 SELF-ADHERED SHEET MEMBRANE AIR BARRIER

- A. Type 1: Self-adhered membrane consisting of a breathable carrier film with a specially designed adhesive, which permits the transfusion of water vapor and provides superior protection against the damaging effects of air and water ingress on building structures, Product shall have the following minimum physical properties
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. GCP Applied Technologies.; Perm-A-Barrier VPS
 - b. Henry Company; Blueskin VP 160
 - c. Carlisle CCW; Fire Resist 705 VP
 2. Physical and Performance Properties:
 - a. Air Permeance: Maximum 0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. (0.02 L/s x sq. m of surface area at 75-Pa) pressure difference; ASTM E 2178.
 - b. Vapor Permeance: Minimum 10 perm; ASTM E 96
 - c. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
- B. ACCESSORY MATERIALS
- C. General: Accessory materials recommended by air-barrier manufacturer to produce a complete air-barrier assembly and compatible with primary air-barrier membrane.
- D. Primer: Liquid waterborne primer recommended for substrate by air-barrier material manufacturer.
- E. Counterflashing Strip: Modified bituminous 40-mil- (1.0-mm-) thick, self-adhering sheet consisting of 32 mils (0.8 mm) of rubberized asphalt laminated to an 8-mil- (0.2-mm-) thick, cross-laminated polyethylene film with release liner backing.
- F. Butyl Strip: Vapor retarding, 30 to 40 mils (0.76 to 1.0 mm) thick, self-adhering; polyethylene-film-reinforced top surface laminated to layer of butyl adhesive, with release liner backing.

- G. Modified Bituminous Strip: Vapor retarding, 40 mils (1.0 mm) thick, smooth surfaced, self-adhering; consisting of 36 mils (0.9 mm) of rubberized asphalt laminated to a 4-mil- (0.1-mm-) thick, cross-laminated polyethylene film with release liner backing.
- H. Termination Mastic: Air-barrier manufacturer's standard cold fluid-applied elastomeric liquid; trowel grade.
- I. Substrate-Patching Membrane: Manufacturer's standard trowel-grade substrate filler.
- J. Adhesive and Tape: Air-barrier manufacturer's standard adhesive and pressure-sensitive adhesive tape.
- K. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 316, 0.040-inch thick, and Series 300 stainless-steel fasteners.
- L. Modified Bituminous Transition Strip: Vapor retarding, 40 mils (1.0 mm) thick, smooth surfaced, self-adhering; consisting of 36 mils (0.9 mm) of rubberized asphalt laminated to a 4-mil- (0.1-mm-) thick polyethylene film with release liner backing.
- M. Elastomeric Flashing Sheet: ASTM D 2000, minimum 50- to 65-mil- (1.3- to 1.6-mm-) thick, cured sheet neoprene with manufacturer-recommended contact adhesives and lap sealant with stainless-steel termination bars and fasteners
- N. Preformed Silicone-Sealant Extrusion: Manufacturer's standard system consisting of cured low-modulus silicone extrusion, sized to fit opening widths, with a single-component, neutral-curing, Class 100/50 (low-modulus) silicone sealant for bonding extrusions to substrates.
 - 1. Products: Subject to compliance with requirements available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Dow Corning Corporation; 123 Silicone Seal.
 - b. Momentive Performance Materials Inc.; US11000 UltraSpan.
 - c. Tremco Incorporated, an RPM company; Spectrem Simple Seal.
- O. Joint Sealant: ASTM C 920, single-component, neutral-curing silicone; Class 50/50 (medium modulus), Grade NS, Use NT related to exposure, and, as applicable to joint substrates indicated, Use O. Comply with Section 079200 "Joint Sealants."
 - 1. Seals to air barrier and membrane wall materials shall be Dow Corning 758 medium modulus silicone complying with ASTM C920 as recommended by the sealant and air barrier manufacturer. The sealant shall be designed for adhering to low energy surfaces common in sheet or peel and stick weather resistant barriers. Compatibility and adhesion of sealants with air barrier materials shall be demonstrated by the sealant and membrane manufacturers, based on testing and shall be submitted in writing. Test procedure shall be as indicated below and as specified herein.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
 - 1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.

2. Verify that concrete has cured and aged for minimum time period recommended by air-barrier manufacturer.
3. Verify that concrete is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
4. Verify that masonry joints are flush and completely filled with mortar.

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

3.2 SURFACE PREPARATION

- A. Clean, prepare, and treat substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for air-barrier application.
- B. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.
- C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.
- D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate-patching membrane.
- E. Remove excess mortar from masonry ties, shelf angles, and other obstructions.
- F. Prepare, fill, prime, and treat joints and cracks in substrates. Remove dust and dirt from joints and cracks according to ASTM D 4258.
- G. Bridge and cover expansion joints and discontinuous wall-to-wall, deck-to-wall, and deck-to-deck joints with overlapping modified bituminous strips.
- H. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.
- I. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

3.3 JOINT TREATMENT

- A. Concrete and Masonry: Prepare, treat, rout, and fill joints and cracks in substrate according to ASTM C 1193 and air-barrier manufacturer's written instructions. Remove dust and dirt from joints and cracks complying with ASTM D 4258 before coating surfaces.
- B. Gypsum Sheathing: Fill joints greater than 1/8 inch with sealant according to ASTM C 1193 and air-barrier manufacturer's written instructions. Apply first layer of fluid air-barrier material at joints. Tape joints with joint reinforcing strip after first layer is dry. Apply a second layer of fluid air-barrier material over joint reinforcing strip.

3.4 AIR BARRIER MEMBRANE INSTALLATION

- A. General: Apply air barrier membrane to achieve a continuous air barrier according to air barrier manufacturer's written instructions.
- B. Install air barrier to dry surfaces at air and surface temperatures of 4°C (40°F) and above in accordance with manufacturer's recommendations, at locations indicated on Construction Documents.
- C. Prime substrate to receive air barrier membrane as required per manufacturers written instructions.
- D. Precut pieces of air barrier into easily handled lengths.
- E. Remove release linear and position membrane carefully before placing against the surface.
- F. Begin installation at the base of the wall placing top edge of membrane immediately below any masonry reinforcement or ties protruding from substrate.
- G. When properly positioned, place against surface by pressing firmly into place. Roll membrane with extension-handled countertop roller immediately after placement.
- H. Overlap adjacent pieces 50 mm (2 in.) and roll seams.
- I. Subsequent sheets of membrane applied above shall be positioned immediately 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.
- J. Seal around masonry reinforcing or ties and all penetrations with penetration & termination sealant.
- K. Coordinate the installation of air barrier with roof installer to ensure continuity of membrane with roof air barrier.
- L. At end of each working day seal top edge of air barrier to substrate with termination sealant.
- M. Do not expose air barrier membrane to sunlight for more than 150 days prior to enclosure.
- N. 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.

3.5 TRANSITION MEMBRANE INSTALLATION

- A. Install strips, transition membrane, and auxiliary materials according to air barrier manufacturer's written instructions to form a seal with adjacent construction and maintain a continuous air barrier. Install all transition membrane only after application of air barrier.
- B. Apply primer to substrates to receive transition membrane at required rate and allow to dry. Limit priming to areas that will be covered by transition tape in same day. Re-prime areas exposed for more than 24 hours.
 - 1. Prime glass-fiber-surfaced gypsum sheathing not covered with air membrane material with number of prime coats needed to achieve required bond, with adequate drying time between coats.
- C. Connect and seal exterior wall air barrier membrane continuously to roofing membrane air barrier, concrete below-grade structures, floor-to floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.
- D. At end of each working day, seal top edge transition membrane to substrate with termination sealant.
- E. Apply joint sealants forming part of air barrier assembly within sealant manufacturer's recommended application temperature ranges. Consult sealant manufacturer when sealant cannot be applied within these temperature ranges.
- F. Wall Openings: Prime concealed perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply transition membrane so that a minimum of 3 inches (75 mm) of coverage is achieved over both substrates.
 - 1. Transition Membrane: Roll firmly to enhance adhesion.
- G. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of air barrier membrane with foam sealant.
- H. Repair punctures, voids, and deficient lapped seams in transition membrane. Slit and flatten fish-mouths and blisters. Patch with transition membrane extending 6 inches (150 mm) beyond repaired areas in strip direction.

3.6 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Inspections: Air-barrier materials, accessories, and installation are subject to inspection for compliance with requirements. Inspections may include the following:
 - 1. Continuity of air-barrier system has been achieved throughout the building envelope with no gaps or holes.
 - 2. Continuous structural support of air-barrier system has been provided.
 - 3. Masonry and concrete surfaces are smooth, clean, and free of cavities, protrusions, and mortar droppings.
 - 4. Site conditions for application temperature and dryness of substrates have been maintained.

5. Maximum exposure time of materials to UV deterioration has not been exceeded.
6. Surfaces have been primed.
7. Laps in sheet materials have complied with the minimum requirements and have been shingled in the correct direction (or mastic applied on exposed edges), with no fishmouths.
8. Termination mastic has been applied on cut edges.
9. Air barrier has been firmly adhered to substrate.
10. Compatible materials have been used.
11. Transitions at changes in direction and structural support at gaps have been provided.
12. Connections between assemblies (membrane and sealants) have complied with requirements for cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.
13. All penetrations have been sealed.

C. Tests: Contractor shall engage accredited testing agency to perform the following tests:

1. Adhesion Testing: Air-barrier assemblies will be tested for minimum air-barrier adhesion of 30 lbf/sq. in. according to ASTM D 4541 for each 800 sq. ft. of installed air barrier or part thereof.

D. Air barriers will be considered defective if they do not pass tests and inspections.

1. Apply additional air-barrier material, according to manufacturer's written instructions, where inspection results indicate insufficient thickness.
2. Remove and replace deficient air-barrier components for retesting as specified above.

E. Repair damage to air barriers caused by testing; follow manufacturer's written instructions.

3.7 CLEANING AND PROTECTION

A. Protect air-barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.

1. Protect air barrier from exposure to UV light and harmful weather exposure as required by manufacturer. If exposed to these conditions for more than 60 days, remove and replace air barrier or install additional, full-thickness, air-barrier application after repairing and preparing the overexposed membrane according to air-barrier manufacturer's written instructions.
2. Protect air barrier from contact with incompatible materials and sealants not approved by air-barrier manufacturer.

B. Clean spills, stains, and soiling from construction that would be exposed in the completed Work, using cleaning agents and procedures recommended by manufacturer of affected construction.

C. Remove masking materials after installation.

END OF SECTION

SECTION 074113 - STONE COATED METAL ROOF PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Batten-seam stone coated metal roof panels
2. Composite roof insulation
3. Vapor Retarder

B. Related Sections:

1. Section 061053 "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking
2. Section 061600 "Gypsum Sheathing"
3. Section 07620 "Sheet Metal Flashing and Trim" for metal roof flashings and counter flashings
4. Section 07631 "Gutters and Downspouts"
5. Section 079200 "Joint Sealants" for joint sealants, joint fillers, and joint preparation

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site

1. Meet with Owner, Architect, Owner's insurer if applicable, metal panel Installer, metal panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal panels, including installers of roof accessories and roof-mounted equipment.
2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review methods and procedures related to metal panel installation, including manufacturer's written instructions.
4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
5. Review structural loading limitations of deck during and after roofing.
6. Review flashings, special details, drainage, penetrations, equipment curbs, and condition of other construction that affect metal panels.
7. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
8. Review temporary protection requirements for metal panel systems during and after installation.
9. Review procedures for repair of metal panels damaged after installation.
10. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.3 ACTION SUBMITTALS

A. Sustainable Design Submittals: Provide Sustainable Design Submittals in Accordance with Section 018113.

1. Building Product Disclosure Requirements: To encourage the use of building products that are working to minimize their environmental and health impacts, provide the following information when available:

- a. Environmental Product Declaration: Submit with Product-specific Type III or Industry-wide Type III Environmental Product Declaration (EPD).
 - 2. Recycled Content: The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.
 - 3. Regional Materials: Materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles (160 km) of Project Site. If only a fraction of a product or material is extracted/harvested/recovered and manufactured locally, then only that percentage (by weight) shall contribute to the regional value.
 - B. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.
 - C. Shop Drawings:
 - 1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
 - 2. Insulation fastening patterns for corner, perimeter, and field of roof locations to be coordinated with architectural metal structural decking
 - 3. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches.
 - D. Samples for Initial Selection: For each type of metal panel indicated with factory-applied color finishes.
 - 1. Include similar Samples of trim and accessories involving color selection.
 - E. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.
 - 1. Metal Panels: 12 inches long by actual panel width. Include clips, fasteners, closures, and other metal panel accessories.
- 1.4 INFORMATIONAL SUBMITTALS
- A. Qualification Data: For Installer.
 - B. Product Test Reports: For each product, for tests performed by a qualified testing agency.
 - C. Field quality-control reports.
 - D. Sample Warranties: For special warranties.
- 1.5 CLOSEOUT SUBMITTALS
- A. Maintenance Data: For metal panels to include in maintenance manuals.
- 1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
 - 1. Build mockup of typical roof area and eave including fascia as shown on Drawings; approximately 48 inches square by full thickness, including attachments underlayment, and accessories.
 - 2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

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

1.8 FIELD CONDITIONS

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

1.9 COORDINATION

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

1.10 WARRANTY

- A. Special Warranty: Provide manufacturer's 50-year fully transferable, limited warranty for defects as well as the following:
 - 1. 120-mph Wind Warranty
 - 2. Hail Impact Warranty
 - 3. Fire: Class A Fire Rated System

PART 2 - PRODUCTS

2.1 BATTEN-SEAM METAL ROOF PANELS

- A. Provide factory-formed metal roof panel assembly designed to be installed by covering vertical side edges of adjacent panels with battens and mechanically attaching panels to supports using concealed clips. Include battens and accessories required for weathertight installation.
1. Basis-of-Design: Westlake Royal Roofing LLC, Unified Steel™ Stone Coated Roofing, or approved equal.
 2. Coated Steel Sheet: ASTM A 792 Grade 33 with an AZ 50 class, hot-dipped aluminum-zinc alloy coating and a thickness of 0.017-inch (0.43 mm). Exposed surface is covered by pressed colored stone granules embedded in an acrylic resin base coating, followed with a clear acrylic glaze. Weight of coated steel is 1.3 psf
 - a. Nominal Size and Color: PINE CREST Shingle: Panel is 16 inches by 51-inches (407 mm by 1296 mm) with an installed exposure of 14-inches by 47- 1/2-inches (356 mm by 1207 mm). Side laps are 3-1/2-inches (89 mm) top course section right side-lap and 2-1/2-inches (64 mm) bottom course section rightside-lap. Color as selected from Manufacturer’s line of available colors and to match the existing building as close as possible.
 3. Batten Material: Steel, minimum 20 Gauge, ASTM A653 galvanized steel, formed into “hat channel”, or other sections with minimum height of 1-1/2-inch with bends at 90 degrees
 4. Clips: **[One-piece fixed]** **[Two-piece floating]** to accommodate thermal movement.
- B. Insulated Sheathing: Provide preassembled panel consisting of one-layer 7/16” oriented strand board top surface bonded to 3 in thick polyisocyanurate foam.
1. Basis-of-Design: ThermaCal Non-Ventilated Roof Insulation panels by GAF, or manufacturer’s approved equal;
 2. Accessories and Fasteners: Roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with other roofing system components
- C. Self-Adhering, High-Temperature Underlayment: Provide self-adhering, cold-applied, sheet underlayment, a minimum of 30 mils thick, specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer when recommended by underlayment manufacturer.
1. Thermal Stability: Stable after testing at 240 deg F ASTM D1970.
 2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F ASTM D1970.
- D. Slip Sheet: Manufacturer's recommended slip sheet, of type required for application.
- E. Vapor Retarder: Polyethylene Film: ASTM D 4397, 10 mils thick, minimum, with maximum permeance rating of 0.75 perms;
1. Basis-of-Design: Sika Vapor Retarder PE 10 or manufacturer approved equal
 2. Adhesive: Manufacturer’s standard lap adhesive, listed by FM Approvals, for vapor retarder application

2.2 MISCELLANEOUS MATERIALS

- A. Sheet Metal Materials: Aluminum-Zinc Alloy Coated Steel sheet, ASTM A 792/A 792M, color and surface finish matching roof panels.
- B. Panel Accessories: Provide components required for a complete, weathertight panel system. Match material and finish of metal panels unless otherwise indicated.
 - 1. Hips, Ridges, and Rakes: Aluminum-Zinc Alloy Coated Steel sheet, nominal .0170 inches. Pressure formed to match roofing material, color, and finish to match panels.
 - 2. End Cap: Unified Steel™ End Disk Aluminum-Zinc Alloy Coated Steel sheet, nominal .0170-inch. Circular cap to match roofing material, color, and finish to match panels. To be applied at open end of hip and ridge at eave.
- C. Trim to be of same material, panel profile, and color as roof panels.
- D. Valley and other Flashings: Aluminum zinc alloy coated sheet ASTM-A792/A792M or G-90 Galvanized. Do not use copper and lead flashings due to metal incompatibility.
- E. Panel Fasteners: Nails or Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.
- F. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are non-staining, and do not damage panel finish.
 - 1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
 - 2. Joint Sealant: ASTM C920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.
 - 3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C1311.

2.3 FABRICATION

- A. Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.
 - 1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
 - 2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
 - 3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
 - 4. Sealed Joints: Form non-expansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.

5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.
 - a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal roof panel manufacturer for application, but not less than thickness of metal being secured.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.
 1. Examine primary and secondary roof framing to verify that rafters, purlins, angles, channels, and other structural panel support members and anchorages have been installed within alignment tolerances required by metal roof panel manufacturer.
 2. Examine solid roof sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal roof panel manufacturer.
 - a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

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

3.3 SUBSTRATE BOARD INSTALLATION

- A. Install substrate board with long joints in continuous straight lines, with end joints staggered not less than 24 inches (610 mm) in adjacent rows.
- B. At steel roof decks, install substrate board at right angle to flutes of deck.
 1. Locate end joints over crests of steel roof deck.
- C. Tightly butt substrate boards together.
- D. Cut substrate board to fit tight around penetrations and projections, and to fit tight to intersecting sloping roof decks.
- E. Fasten substrate board to top flanges of steel deck according to recommendations in FM Approvals' RoofNav assembly requirements and FM Global Property Loss Prevention Data Sheet 1-29 for specified Windstorm Resistance Classification.

3.4 VAPOR RESTARDER INSTALLATION

- A. Polyethylene Film: Loosely lay polyethylene-film vapor retarder in a single layer over area to receive vapor retarder, side and end lapping each sheet a minimum of 2 and 6 inches (50 and 150 mm), respectively.
 - 1. Extend vertically up parapet walls and projections to a minimum height equal to height of the insulation and cover board.
 - 2. Continuously seal side and end laps with adhesive.

3.5 INSULATION INSTALLATION

- A. Install composite insulation according to manufacturer's written instructions
- B. Protect nail base insulation work from exposure to moisture damage and deterioration

3.6 INSTALLATION OF UNDERLAYMENT

- A. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply at locations indicated [**below**] [**on Drawings**], wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches (152 mm) staggered 24 inches (610 mm) between courses. Overlap side edges not less than 3-1/2 inches (90 mm). Extend underlayment into gutter trough. Roll laps with roller. Cover underlayment within 14 days.
 - 1. Apply over the entire roof surface.
- B. Slip Sheet: Apply slip sheet over underlayment before installing metal roof panels.
- C. Flashings: Install flashings to cover underlayment to comply with requirements specified in Section 076200 "Sheet Metal Flashing and Trim."

3.7 INSTALLATION OF BATTEN-SEAM METAL ROOF PANELS

- A. Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
 - 1. Work from numerous bundles of panels to help ensure overall color batch/production run blending throughout installation
 - 2. Cut and bend panels at gables, hips, valleys, walls, and ridge to complete panel installation as per manufacturer's installation instructions.
 - 3. Install ridge trim, hip caps, and counter flashing as per Unified Steel's installation instructions.
 - 4. Fasten with fasteners in accordance with local code requirements and use the same fasteners for Hips, Ridges and Rakes
- B. Install battens as required in manufacturer's installation manual with appropriate spacing as determined by panel profile spacers specified.
 - 1. Fasten battens at all intersections of counter battens, ensuring that batten joints are located at counter batten support

2. Install battens at rakes, hips, and ridges
3. Install battens at valleys with full run frame for complete support of valley flange

3.8 CLEANING AND PROTECTION

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

END OF SECTION

SECTION 074214 - METAL WALL PANELS, PERFORATED

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Exposed-fastener, lap-seam metal wall panels in the following applications:
 - 1. Perforated metal panels mounted on steel framing to form exterior screen assemblies.
- B. Related Requirements:
 - 1. Section 051200 "Structural Steel Framing" for screen system framing.

1.2 ACTION SUBMITTALS

- A. Sustainable Design Submittals: Provide Sustainable Design Submittals in Accordance with Section 018113.
 - 1. Building Product Disclosure Requirements: To encourage the use of building products that are working to minimize their environmental and health impacts, provide the following information when available:
 - a. Environmental Product Declaration: Submit with Product-specific Type III or Industry-wide Type III Environmental Product Declaration (EPD).
 - 2. Recycled Content: The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.
 - 3. Regional Materials: Materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles (160 km) of Project Site. If only a fraction of a product or material is extracted/harvested/recovered and manufactured locally, then only that percentage (by weight) shall contribute to the regional value.
- B. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.
- C. Shop Drawings: Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
- D. Samples for Verification: For each type of exposed finish, prepared on Samples of size indicated below:
 - 1. Metal Panels: 12 inches (305 mm) long by actual panel width. Include fasteners, closures, and other metal panel accessories.

1.3 INFORMATIONAL SUBMITTALS

- A. Sample Warranties: For special warranties.

1.4 CLOSEOUT SUBMITTALS

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

1.5 DELIVERY, STORAGE, AND HANDLING

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

1.6 WARRANTY

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Recycled Content of Aluminum and Steel Components: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 20 percent.
- B. Regional Materials: Products shall be manufactured within 500 miles (800 km) of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.
- C. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 1592:
 - 1. Wind Loads: As indicated on Drawings.
 - 2. Other Design Loads: As indicated on Drawings.
 - 3. Deflection Limits: For wind loads, no greater than 1/240 of the span.
- D. 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.

2.2 MATERIALS, GENERAL

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 20 percent.
- B. Recycled Content of Aluminum and Steel Components: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 20 percent.
- C. Regional Materials: Products shall be manufactured within 500 miles (800 km) of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.

2.3 EXPOSED-FASTENER, LAP-SEAM METAL WALL PANELS

- A. General: Provide factory-formed metal 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. Tapered-Rib-Profile, Exposed-Fastener Metal Wall Panels: Formed with raised, trapezoidal major ribs and intermediate stiffening ribs symmetrically spaced between major ribs.
 1. Basis-of-Design Product for Perforated Panels: Subject to compliance with requirements, provide Petersen Pac-Clad 7.2 Panel, or comparable product by one of the following:
 - a. Fabral.
 - b. MBCI; a division of NCI Building Systems, L.P.
 - c. Centria Architectural Systems
 2. Material: Aluminum-zinc alloy-coated (Galvalume) Steel Sheet: ASTM A 792/A 792 M, Class AZ50 Grade 50 (Class AZM150, Grade 275), structural steel quality.
 - a. Thickness: 24 gauge
 - b. Surface: Smooth, flat finish.
 - c. Exterior Finish: Two-coat fluoropolymer.
 - d. Color: Silversmith
 3. Major-Rib Spacing: 12 inches (305 mm) o.c.
 4. Panel Coverage: Manufacturer's standard.
 5. Panel Height: 1.5 inches (76 mm).
 6. Perforation Pattern for Screen Panels: 1/4" Round
 - a. Free Area: 40 percent.
 7. Exterior Corners: Prefabricated corner units with mitered and structurally bonded corners to produce seamless appearance, manufactured of same metal substrate coil as wall panels, and fabricated without welded joints or rivets.

2.4 MISCELLANEOUS MATERIALS

- A. Miscellaneous Metal Subframing and Furring: ASTM C 645, cold-formed, metallic-coated steel sheet, ASTM A 653/A 653M, G90 (Z275 hot-dip galvanized) coating designation or ASTM A 792/A 792M, Class AZ50 (Class AZM150) aluminum-zinc-alloy coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.
- B. Panel Accessories: Provide components required for a complete, panel system including trim, corner units, clips, flashings, sealants, gaskets, fillers, and similar items. Match material and finish of metal panels unless otherwise indicated.
- C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to provide finished appearance. Finish flashing and trim with same finish system as adjacent metal panels.
- D. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.
- E. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.
 - 1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
 - 2. Joint Sealant: ASTM C 920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.
 - 3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

2.5 FABRICATION

- A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. Provide panel profile, including major ribs and intermediate stiffening ribs, for full length of panel.
- C. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.
 - 1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
 - 2. Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
 - 3. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
 - 4. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.
 - a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal wall panel manufacturer for application but not less than thickness of metal being secured.

2.6 FINISHES

- A. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Steel Panels and Accessories:
 - 1. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 2. Finish complete project panels from single finishing plant and single paint batch

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

- A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.

3.3 METAL PANEL INSTALLATION

- A. General: Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
 - 1. Shim or otherwise plumb substrates receiving metal panels.

2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
 3. Install screw fasteners in predrilled holes.
 4. Locate and space fastenings in uniform vertical and horizontal alignment.
 5. Install flashing and trim as metal panel work proceeds.
 6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
 7. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
 8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.
- B. Fasteners: Self-tapping screws, bolts, nuts, and other acceptable fasteners recommended by panel manufacturer. All exposed fasteners must be stainless steel with heads matching color of metal wall panels by means of factory-applied coating.
- C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.
- D. Lap-Seam Metal Panels: Fasten metal panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.
1. Lap ribbed or fluted sheets one full rib. Apply panels and associated items true to line for neat and weathertight enclosure.
 2. Provide metal-backed washers under heads of exposed fasteners bearing on weather side of metal panels.
 3. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.
 4. Install screw fasteners with power tools having controlled torque adjusted to compress washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.
 5. Flash and seal panels with weather closures at perimeter of all openings.
- E. Accessory Installation: Install accessories with positive anchorage and provide for thermal expansion. Coordinate installation with flashings and other components.
1. Install components required for a complete metal panel system including trim, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal wall panel manufacturer; or, if not indicated, provide types recommended by metal panel manufacturer.
- F. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that are permanently watertight.
1. Install exposed flashing and trim that is without buckling and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and achieve waterproof performance.
 2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (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 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 CLEANING AND PROTECTION

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

END OF SECTION

SECTION 074216 - METAL COMPOSITE MATERIAL WALL PANELS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Heavy Duty Metal composite material (MCM) panels with fire-retardant core used in exterior vertical wall and horizontal soffit assemblies.

1.2 ACTION SUBMITTALS

- A. Sustainable Design Submittals: Provide Sustainable Design Submittals in Accordance with Section 018113.
 - 1. Building Product Disclosure Requirements: To encourage the use of building products that are working to minimize their environmental and health impacts, provide the following information when available:
 - a. Environmental Product Declaration: Submit with Product-specific Type III or Industry-wide Type III Environmental Product Declaration (EPD).
 - 2. Recycled Content: The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.
 - 3. Regional Materials: Materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles (160 km) of Project Site. If only a fraction of a product or material is extracted/harvested/recovered and manufactured locally, then only that percentage (by weight) shall contribute to the regional value.
- B. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.
- C. Shop Drawings:
 - 1. Include fabrication and installation layouts of metal composite material panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment assembly, trim, flashings, closures, and accessories; and special details.
 - 2. Accessories: Include details of the flashing, trim and anchorage, at a scale of not less than 1-1/2 inches per 12 inches (1:10).
- D. Delegated-Design Submittal: For metal composite material panel systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- E. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.
 - 1. Metal Composite Material Panels: 12 inches (305 mm) long by actual panel width. Include fasteners, closures, and other metal composite material panel accessories.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

- B. Product Test Reports: For each product, tests performed by a qualified testing agency.
- C. Sample Warranties: For special warranties.

1.4 CLOSEOUT SUBMITTALS

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

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

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

1.7 FIELD CONDITIONS

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

1.8 COORDINATION

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

1.9 WARRANTY

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Comply with performance requirements specified, as determined by testing of manufacturer's standard metal composite material panel systems representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
- B. Delegated Design: Design metal composite material panel systems, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- C. Structural Performance: Provide metal composite material panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 330:
 - 1. Wind Loads: As indicated on Drawings.
 - 2. Other Design Loads: As indicated on Drawings.
 - 3. Deflection Limits: For wind loads, no greater than 1/180 of the span.
- D. 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.
- E. Fire-Test-Response Characteristics: Provide metal composite material wall panels and system components with the following fire-test-response characteristics as determined by testing identical metal composite material wall panels and system components per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Multistory Fire Test: Tested mockup, representative of completed multistory wall assembly of which metal wall panels are a part, complies with NFPA 285 for test method and required fire-test-response characteristics of exterior non-load-bearing wall panel assemblies.

2.2 METAL COMPOSITE MATERIAL WALL PANELS

- A. Metal Composite Material Wall Panel Systems: Provide factory-formed and -assembled, metal composite material wall panels fabricated from two metal facings that are bonded to a solid, extruded thermoplastic core; formed into profile for installation method indicated. Include attachment assembly components, panel stiffeners, and accessories required for weathertight system.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide ALPOLIC/fr HD (heavy-duty) composite fire-retardant metal panels or an approved comparable product.

- B. Aluminum-Faced Composite Wall Panels: Formed with 0.032-inch thick, coil-coated aluminum sheet facings.
 - 1. Panel Thickness: 4 mm
 - 2. Core: Fire retardant (FR)
 - 3. Exterior Finish: Two-coat fluoropolymer.
 - a. Color: As selected from manufacturer's full range
- C. Attachment Assembly Components: Formed from extruded aluminum.
- D. Attachment Assembly: Rainscreen principal system.

2.3 MISCELLANEOUS MATERIALS

- A. Adjustable Composite Metal sub-framing Thermal Spacer: Minimum 16 ga., galvanized steel; provide with slotted holes for plumb adjustment.
 - 1. Sub-framing Thermal Spacer: Provide one of the following:
 - a. GreenGirt Delta Adjustable System by ADVANCED ARCHITECTURAL PRODUCTS
 - b. Alpha Hci System horizontal subframing with thermal spacer by ECO CLADDING HCI
 - c. Nvelope NH3 horizontal bracket system by SFS
- B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal composite material panels unless otherwise indicated.
- C. Flashing and Trim: Provide flashing and trim formed from same material as metal composite material panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal composite material panels.
- D. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal composite material panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.

2.4 FABRICATION

- A. General: Fabricate and finish metal composite material panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. Fabricate metal composite material panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.
- C. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams or concealed lap splice. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
3. Sealed Joints: Form non-expansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
5. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.
 - a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal wall panel manufacturer for application but not less than thickness of metal being secured.

2.5 FINISHES

- A. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Aluminum Panels and Accessories:
 1. Two-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal composite material 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 composite material 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 composite material wall panel manufacturer.
 - a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. Examine roughing-in for components and assemblies penetrating metal composite material panels to verify actual locations of penetrations relative to seam locations of metal composite material panels before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal composite material panel manufacturer's written recommendations.

3.3 METAL COMPOSITE MATERIAL PANEL INSTALLATION

- A. General: Install metal composite material panels according to manufacturer's written instructions in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to supports unless otherwise indicated. Anchor metal composite material panels and other components of the Work securely in place, with provisions for thermal and structural movement.
 1. Shim or otherwise plumb substrates receiving metal composite material panels.
 2. Flash and seal metal composite material panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal composite material panels are installed.
 3. Install screw fasteners in predrilled holes.
 4. Locate and space fastenings in uniform vertical and horizontal alignment.
 5. Install flashing and trim as metal composite material panel work proceeds.
 6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
 7. Align bottoms of metal composite material panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
 8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.
- B. Fasteners:
 1. Aluminum Panels: Use aluminum or stainless-steel fasteners for surfaces exposed to the exterior; use aluminum or galvanized-steel fasteners for surfaces exposed to the interior.
- C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal composite material panel manufacturer.
- D. Attachment Assembly, General: Install attachment assembly required to support metal composite material 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.
- E. Installation: Attach metal composite material wall panels to supports at locations, spacings, and with fasteners recommended by manufacturer to achieve performance requirements specified.
 1. Rainscreen Systems: Do not apply sealants to joints unless otherwise indicated.
- F. Rainscreen-Principle Installation: Install using manufacturer's standard assembly with vertical channel that provides support and secondary drainage assembly, 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 composite material wall panels by inserting horizontal support pins into notches in vertical channels and into flanges of panels. Leave horizontal and vertical joints with open reveal.
 1. Install 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.

- G. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
1. Install components required for a complete metal composite material panel assembly including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal composite material panel manufacturer; or, if not indicated, provide types recommended in writing by metal composite material panel manufacturer.
- H. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that are permanently watertight.
1. Install exposed flashing and trim that is without buckling and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof 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 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 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align metal composite material wall panel units within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m), non-accumulative, 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.

3.5 CLEANING AND PROTECTION

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

END OF SECTION

SECTION 075216 - STYRENE-BUTADIENE-STYRENE (SBS) MODIFIED BITUMINOUS MEMBRANE ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Three-ply built-up Styrene-butadiene-styrene (SBS)-modified bituminous membrane roofing.
2. Vapor retarder.
3. Roof insulation.
4. Cover board.
5. Roof Walkways.

B. Section includes the installation of sound-absorbing insulation strips in ribs of roof deck. Sound-absorbing insulation strips are furnished under Section 053100 "Steel Decking."

C. Related Requirements:

1. Section 061053 "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking, and for wood-based, structural-use roof deck panels.
2. Section 061600 "Gypsum Sheathing" for roof sheathing panels
3. Section 072100 "Thermal Insulation" for insulation beneath the roof deck.
4. Section 076200 "Sheet Metal Flashing and Trim" for metal roof flashings and counterflashings.
5. Section 077100 "Roof Specialties" for premanufactured metal copings, roof edge fasciae, and roof edge flashings
6. Section 077129 "Manufactured Roof Expansion Joints" for premanufactured roof expansion-joint assemblies.
7. Section 079200 "Joint Sealants" for joint sealants, joint fillers, and joint preparation.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Roofing Conference: Conduct conference at Project site a minimum of seven (7) days prior to the start of work.

1. Meet with Owner, Architect, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For roofing system, to be Project specific, which includes at a minimum editing of manufacturer's standard details to indicate components and requirements to be utilized within the actual work, and keyed to the project documents, i.e. roof plan and details. Include plans, elevations, sections, details, and attachments to other work, including:
 - 1. Layout and thickness of insulation.
 - 2. Base flashings and membrane terminations.
 - 3. Flashing details at penetrations.
 - 4. Tapered insulation, including slopes.
 - 5. Roof plan showing orientation of steel roof deck and orientation of roof membrane, fastening spacings, and patterns for mechanically fastened roofing system.
 - 6. Crickets, saddles, and tapered edge strips, including slopes.
 - 7. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
 - 8. Tie-in with adjoining air barrier.
- C. Samples for Verification: For the following products:
 - 1. Cap Sheet, of color required
 - 2. Flashing sheet, of color required
 - 3. Liquid flashing with finish coating

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and Manufacturer
- B. Product Test Reports: For roof membrane and insulation, tests performed by a qualified testing agency, indicating compliance with specified requirements.
- C. Evaluation Reports: For components of membrane roofing system, from ICC-ES.
- D. Field Test Reports:
 - 1. Fastener-pullout test results and manufacturer's revised requirements for fastener patterns.
- E. Field quality-control reports.
- F. Sample Warranties: For manufacturer's special warranties.

1.5 CLOSEOUT SUBMITTALS

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

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer that is UL listed and FM Global approved for roofing system identical to that used for this Project.

- B. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.
- B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer.
 - 1. Protect stored liquid material from direct sunlight.
 - 2. 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.
 - 1. Store in a dry location.
 - 2. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.
- D. Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck.

1.8 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.9 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period.
 - 1. Special warranty includes roof membrane, base flashings, roof insulation, fasteners, cover boards, vapor retarder, substrate board, and other components of roofing system.
 - 2. Warranty Period: 20 years from date of Substantial Completion.
- B. Special Project Warranty: Submit roofing Installer's warranty, on warranty form at end of this Section, signed by Installer, covering the Work of this Section, including all components of roofing system such as roof membrane, base flashing, roof insulation, fasteners, cover boards, substrate boards, vapor retarders, 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 PERFORMANCE REQUIREMENTS

- A. General Performance: Installed roofing system and flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roof system and flashings shall remain watertight.
 - 1. Accelerated Weathering: Roof membrane shall withstand 2000 hours of exposure when tested according to ASTM G152, ASTM G154, or ASTM G155.
 - 2. Impact Resistance: Roof membrane shall resist impact damage when tested according to ASTM D3746/D3746M, ASTM D4272/D4272M, or the "Resistance to Foot Traffic Test" in FM Approvals 4470.
- B. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roof membrane manufacturer based on testing and field experience.
- C. Wind Uplift Resistance: Design roofing system to resist the following wind uplift pressures when tested according to FM Approvals 4474, UL 580, or UL 1897:
 - 1. Field-of-Roof Uplift Pressure: 17.0 lbf/sq.ft.
 - 2. Perimeter Uplift Pressure: 28.0 lbf/ sq.ft.
 - 3. Corner Uplift Pressure: 42.0 lbf/sq.ft.
- D. Solar Reflectance and Thermal Emittance: SRI min shall comply with the 2018 IECC rating Table C402.3
 - 1. Minimum Aged Solar Reflectance: 0.575
 - 2. Minimum Aged Thermal Emittance: 0.75
 - 3. Minimum Aged SRI: 64

2.2 MANUFACTURERS

- A. Source Limitations: Obtain components for roofing system from a single roof membrane manufacturer
- B. Provide products from one of the following manufacturers:
 - 1. Elevate (formerly Firestone)
 - 2. GAF
 - 3. Siplast

2.3 BASE SHEET MATERIALS

- A. SBS-Modified Bitumen Non-Woven Glass Fiber Mat Base Sheet: ASTM D6164/D6164M, Type I, Grade S, SBS-modified asphalt sheet, reinforced with polyester fabric, smooth surfaced, suitable for cold adhesive application method.

2.4 CAP SHEET MATERIALS

- A. Granule-Surfaced Roofing Cap Sheet: ASTM D6164/D6164M, Type I, Grade G, SBS-modified asphalt sheet, reinforced with polyester fabric, suitable for cold adhesive application method.
 - 1. Granule Color: White
 - 2. Solar Reflective Incidence: 85 Minimum, when tested in accordance with ASTM E1980-01

2.5 AUXILIARY ROOFING MATERIALS

- A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with other roofing components.
 - 1. Adhesives and Sealants: Comply with VOC limits of authorities having jurisdiction.
- B. Prefabricated Pipe Flashings: As recommended by roof membrane manufacturer.
- C. 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.
- D. Cold-Applied Polymer-Modified Asphalt Adhesive: Roof membrane manufacturer's standard solvent- and asbestos-free, cold-applied adhesive, specially formulated for compatibility and use with [interply sheets] [and] [aggregate surfacing adhesive].
- E. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roofing components to substrate; tested by manufacturer for required pullout strength, and acceptable to roofing system manufacturer.

2.6 VAPOR RETARDER

- A. Self-Adhering-Sheet Vapor Retarder: ASTM D1970/D1970M polyethylene film laminated to layer of rubberized asphalt adhesive, minimum 40-mil total thickness; maximum permeance rating of 0.1 perm cold applied, with slip-resisting surface and release paper backing. Provide primer when recommended by vapor-retarder manufacturer.

2.7 ROOF INSULATION

- A. General: Preformed roof insulation boards, manufactured or approved by roof membrane manufacturer
- B. Polyisocyanurate Board Insulation: ASTM C1289, Type II, Class 1 glass-fiber mat facer on both major surfaces.
 - 1. Acceptable Manufacturers:
 - a. ISO 95+™ GL / ISOGARD™ GL Polyisocyanurate Insulation by Elevate.
 - b. Hunter Panels LLC: H Shield
 - c. GAF: EnergyGuard Polyiso Insulation Board
 - 2. Compressive Strength: 20 psi
 - 3. Size: 48 by 48 inches , or 48" x 96"
 - 4. Thickness: 5.3-inch minimum as required to achieve R-30 minimum continuous insulation value.
- C. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Slope as follows:
 - 1. Slope 1/4 inch per 12 inches as indicated within the project documents.
 - 2. Contractor to provide preformed crickets/tapered insulation sloped twice the tapered insulation slope of the roof area at all rooftop equipment units, roof hatches, and any other curbs/obstructions up- slope for the new tapered insulation to ensure positive drainage, whether

illustrated within the project drawings or not. Contractor is responsible for verifying all locations and quantities with requirements herein.

2.8 INSULATION ACCESSORIES

- A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with other roofing system components.
- B. Fasteners: Factory-coated steel fasteners and metal or plastic plates 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. Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach roof insulation to substrate or to another insulation layer as follows:
 - 1. Modified asphaltic, asbestos-free, cold-applied adhesive.
- D. Cover Board: ASTM C1177/C1177M, glass-mat, water-resistant gypsum board or ASTM C1278/C1278M, fiber-reinforced gypsum board.
 - 1. Basis-of-Design: DensDeck Roof Board or manufacturer approved equal
 - 2. Thickness: Type X 5/8" inch.
- E. Provide liquid flashings at all equipment unit curbs, at base of rising walls, over all new Pipe sleeves at all roof edges, slope transitions, as well as any other locations indicated within the project drawings.

2.9 WALKWAYS

- A. Walkway Pads: Polymer-modified, reconstituted rubber pads with slip-resisting textured surface, manufactured as a traffic pad for foot traffic and acceptable to roofing system manufacturer, 3/8 inch thick, minimum.
 - 1. Pad Size: Approximately 36 by 60 inches
 - 2. Color: Contrasting with cap sheet.
- B. Provide walkways continuously from roof access (i.e. hatch) to all roof top equipment units, and light fixtures and continuously around entire unit/equipment. Contractor to review exact location and extent of walkway with the Owner prior to the start of work.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
 - 1. Verify that roof openings and penetrations are in place, curbs are set and braced, and roof-drain bodies are securely clamped in place.
 - 2. Verify that wood cants, blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
 - 3. Verify that surface plane flatness and fastening of steel roof deck complies with requirements in Section 053100 "Steel Decking."

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

3.2 PREPARATION

- A. Before commencing work each day, the contractor shall prepare all roofing substrates to ensure conditions are satisfactory to proceed with the installation of specified roofing materials. Preparation of substrates includes, but is not limited to, substrate repairs and eliminating all incompatible materials.
- B. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.
- C. 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.
- D. Inspect the deck to verify integrity. Where conditions are found to be unsatisfactory, work shall not begin until conditions are made satisfactory to begin work. Commencing of work shall indicate contractor's acceptance of conditions. Bring any areas of questionable integrity to the Owner's attention. Do not cover any areas of questionable deck or deck out of plane.
- E. Install sound absorbing insulation strips in ribs of acoustical roof decks according to acoustical roof deck manufacturer's written instructions.

3.3 INSTALLATION OF ROOFING, GENERAL

- A. Install modified bituminous membrane roofing system according to roofing system manufacturer's written instructions and applicable recommendations of NRCA/ARMA's "Quality Control Recommendations for Polymer Modified Bitumen Roofing."
 - 1. Install roofing system according to applicable specification plates of NRCA's "The NRCA Roofing and Waterproofing Manual."
- B. Substrate-Joint Penetrations: Prevent roofing asphalt and adhesives from penetrating substrate joints, entering building, or damaging roofing system components or adjacent building construction.
- C. Start installation of modified bituminous membrane roofing in presence of roofing system manufacturer's technical personnel.
- D. Shingling Plies: Install modified bituminous membrane roofing system with membrane plies shingled in direction to shed water
- E. Cooperate with inspecting and testing agencies engaged or required to perform services for installing modified bituminous membrane roofing system.
- F. Coordinate installing roofing system components, so insulation and roofing plies are not exposed to precipitation or left exposed at the end of the workday or when rain is forecast.
- G. Provide cutoffs at end of each day's work to cover exposed ply sheets and insulation with a course of coated felt with joints and edges sealed.

- H. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system.
- I. Remove and discard temporary seals before beginning work on adjoining roofing.
- J. Install roof membrane and auxiliary materials to tie in to existing roofing to maintain weathertightness of transition and to not void warranty for existing roofing system.

3.4 INSTALLATION OF SUBSTRATE BOARD

- A. Install substrate board with long joints in continuous straight lines, with end joints staggered not less than 24 inches (600 mm) in adjacent rows.
 - 1. At steel roof decks, install substrate board at right angle to flutes of deck.
 - a. Locate end joints over crests of steel roof deck.
 - 2. Tightly butt substrate boards together.
 - 3. Cut substrate board to fit tight around penetrations and projections, and to fit tight to intersecting sloping roof decks.
 - 4. Fasten substrate board to top flanges of steel deck to resist uplift pressure at corners, perimeter, and field of roof according to roofing system manufacturers' written instructions.

3.5 INSTALLATION OF VAPOR RETARDER

- A. Self-Adhering-Sheet Vapor Retarder: Prime substrate if required by manufacturer. Install self-adhering-sheet vapor retarder over area to receive vapor retarder, side and end lapping each sheet a minimum of 3-1/2 and 6 inches (90 and 150 mm), respectively.
 - 1. Extend vertically up parapet walls and projections to a minimum height equal to height of the insulation and cover board.
 - 2. Seal laps by rolling.
- B. Completely seal vapor retarder at terminations, obstructions, and penetrations to prevent air movement into roofing system.
- C. At the conclusion of the vapor retarder installation the installation should be watertight.

3.6 INSTALLATION OF INSULATION

- A. Coordinate installing roofing system components, so insulation is not exposed to precipitation or left exposed at the end of the workday.
- B. Comply with roofing system and insulation manufacturer's written instructions for installing roof insulation.
- C. Insulation Cant Strips: Install and secure preformed 45-degree insulation cant strips at junctures of roofing system with vertical surfaces or angle changes greater than 45 degrees.
- D. Install tapered insulation under area of roofing to conform to slopes indicated.

- E. 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.
- F. Cut and fit insulation within 1/4 inch (6 mm) of nailers, projections, and penetrations.
- G. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2.7 inches or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.
- H. 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.
- I. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.
- J. Install tapered edge strips at perimeter edges of roof that do not terminate at vertical surfaces.
- K. Mechanically Fastened and Adhered Insulation: Install first layer of insulation to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.

3.7 INSTALLATION OF COVER BOARDS

- A. Install cover boards over insulation with long joints in continuous straight lines, with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches (150 mm) in each direction.
 - 1. Trim cover board neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
 - 2. At internal roof drains, conform to slope of drain sump.
 - a. Trim cover board, so that water flow is unrestricted.
 - 3. Cut and fit cover board tight to nailers, projections, and penetrations.

3.8 INSTALLATION OF ROOFING MEMBRANE, GENERAL

- A. Install roofing system according to roofing system manufacturer's written instructions and applicable recommendations in ARMA/NRCA's "Quality Control Guidelines for the Application of Polymer Modified Bitumen Roofing."
- B. Start installation of roofing in presence of roofing system manufacturer's technical personnel.
- C. Coordinate installation of roofing system so insulation and other components of the roofing system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is forecast.
 - 1. Provide tie-offs at end of each day's work to cover exposed roofing sheets and insulation with a course of coated felt set in roofing cement or hot roofing asphalt, with joints and edges sealed.
 - 2. Complete terminations and base flashings, and provide temporary seals to prevent water from entering completed sections of roofing system.
 - 3. Remove and discard temporary seals before beginning work on adjoining roofing.

3.9 INSTALLATION OF BASE SHEET

- A. Before installing, unroll base sheet, cut into workable lengths, and allow to lie flat for a time period recommended by manufacturer for the ambient temperature.
- B. Install base-ply sheet according to roofing system manufacturer's written instructions starting at low point of roofing system. Align base-ply sheets without stretching. Extend sheets over and terminate beyond cants, 2- inches minimum.
 - 1. Install one (1) base sheet over the insulation in cold applied roofing adhesive.
 - 2. Lap ply sheet ends eight inches. Stagger end laps twelve inches minimum.

3.10 INSTALLATION OF SBS-MODIFIED BITUMINOUS CAP SHEET

- A. Before installing, unroll cap sheet, cut into workable lengths, and allow to lie flat for a time period recommended by manufacturer for the ambient temperature at which cap sheet will be installed.
- B. Install modified bituminous roofing cap sheet according to roofing manufacturer's written instructions, starting at low point of roofing system.
 - 1. Extend cap sheet over and terminate above cants.
 - 2. Install cap sheet in a shingle fashion.
 - 3. Install cap sheet as follows:
 - a. Adhere to substrate in cold-applied adhesive solidly bonded to the base-ply sheet.
- C. Laps: Accurately align roofing sheets, without stretching, and maintain uniform side and end laps. Stagger end laps. Completely bond and seal laps, leaving no voids.
 - 1. Repair tears and voids in laps and lapped seams not completely sealed.
 - 2. Apply roofing granules to cover exuded bead at laps while bead is hot.
- D. Install roofing sheets so side and end laps shed water. Provide a minimum of 4" side laps and 8" end laps. The end laps shall be staggered. The modified membrane shall be laid in the same direction as the underlayers, but the laps shall not coincide with the laps of the base layers.
- E. Care should be taken to eliminate air entrapment under the membrane.
- F. Extend membrane to the top edge of all cants in a solid layer of adhesive and to the top outside edge of parapet walls / curbs as shown on the drawings.
- G. Heat weld all horizontal seams with an electric seamer designed to weld modified roof systems.
- H. Aesthetics will be a punch list item. The roof must meet the Owner's standards for appearance.

3.11 INSTALLATION OF FLASHING AND STRIPPING

- A. Install base flashing over cant strips and other sloped and vertical surfaces, at roof edges, and at penetrations through roof, and secure to substrates according to roofing system manufacturer's written instructions and as follows:

1. Prepare all walls, penetrations and expansion joints to be flashed and where shown on the drawings, with asphalt primer at manufacturer's recommended rate. Allow primer to dry tack free.
- B. The surface membrane will be used as the flashing membrane and will be adhered to an underlying base ply of 40 mil SBS stripping membrane with manufacturer's flashing grade cold adhesive and nailed off at all vertical surfaces. The entire sheet of flashing membrane must be solidly adhered to the substrate
- C. The surface membrane will be used as the top flashing ply. It shall be solidly adhered to the based flashing ply with flashing grade cold adhesive.
- D. Extend base flashing up walls or parapets a minimum of 8 inches above roofing membrane and 4 inches onto field of roofing membrane.
- E. Secure top of flashing membrane with termination bar and fasten 8-inches o. c. Flashing can be nailed to the top of all wood curbs with ring shanked nails.
- F. Seal all vertical laps of flashing membrane with a three course application of Silver Flash and fiberglass mesh.
- G. Counter flashing, cap flashings, expansion joints, and similar work to be coordinated with modified bitumen roofing work are specified in other Sections.
- H. Roof accessories, Miscellaneous sheet metal accessory items, including piping vents and other devices to be coordinated with modified bituminous roofing system work are in other Sections.
- I. Liquid Flashings: Provide liquid flashings at all equipment unit curbs, over all new Pipe sleeves and at all roof drains and scuppers, as well as all membrane inside and outside corner transitions at vertical parapet walls, backside of piers, etc..
- J. Install roofing cap-sheet stripping where metal flanges and edgings are set on roofing according to roofing system manufacturer's written instructions.
- K. Terminations at vertical surfaces including parapets, curbs, pipe curb assemblies and rooftop equipment.
 1. Prime masonry surfaces.
 2. Extend base ply to top of cant strip, fully adhered to substrate but dry on cant.
 3. Strip in reinforcing layer of base ply from top of curbs, outside face of parapet or just below metal counter-flashing to minimum 3 inches onto roof surface. Secure to wood with nails maximum 9 inches on center. Fully adhere to base ply. Laps in second layer shall be offset from laps in first layer.
 4. Extend cap sheet to top of cants, fully adhere.
 5. Fully adhere base flashing plies to completely cover top of reinforcing layer and to extend minimum 1 inch past toe of reinforcing layer. Nail top of base flashing sheet 9 inches on center to substrate.
 6. Provide Liquid Flashing system
- L. Terminations at Roof Edges:
 1. Extend base ply to top of pre-manufactured cant strip, fully adhered to substrate but dry on cant.

2. Strip in reinforcing layer of base ply from heel of fascia cleat, up and across cant strip and extending minimum 3 inches onto roof surface. Laps in reinforcing layer shall be offset from laps in baselayer.
3. Extend cap sheet to top of cants, fully adhered.
4. Fully adhere base flashing sheet to completely cover reinforcing layer and to extend minimum 1 inch past toe of reinforcing layer.
5. Provide Liquid Flashing system.

M. Termination at Prefabricated Flashing Boots:

1. Extend base ply to penetrating element.
2. Install prefabricated flashing boot per Roof Accessories: Division 7.
3. Install a reinforcing layer of base ply, tight to boot and minimum 6 inches larger in each direction than boot flange.
4. Extend cap sheet to boot and seal perimeter.

N. Miscellaneous Roof Penetrations: Treat as described above for vertical termination and flashing membrane, prefabricated flashing boot or formed lead flashing. No pitch pockets allowed.

3.12 INSTALLATION OF WALKWAYS

A. Walkway Pads: Install walkway pads using units of size indicated or, if not indicated, of manufacturer's standard size, according to walkway pad manufacturer's written instructions.

1. Install walkways at the following locations:
 - a. Locations indicated on Drawings and as required by roof membrane manufacturer's warranty requirements.
2. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

3.13 FIELD QUALITY CONTROL

A. Engage a qualified testing agency to inspect substrate conditions, surface preparation, roof membrane application, flashings, protection, and drainage components, and to furnish reports to Architect.

B. Interim Roof Inspections (minimum four): Arrange for the roofing system manufacturer's technical personnel to inspect the installation of roof membrane system while work is in progress and submit a project specific report to the Architect

C. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion, in presence of Architect, and to prepare inspection report.

1. Notify Architect and Owner 48 hours in advance of date and time of inspection.

D. Perform the following tests:

1. Infrared Thermography: Testing agency shall survey entire roof area using infrared color thermography according to ASTM C1153.
 - a. Perform tests before overlying construction is placed.

- b. After infrared scan, locate specific areas of leaks by electrical capacitance/impedance testing, or by nuclear hydrogen detection testing.
 - c. After testing, repair leaks, repeat tests, and make further repairs until roofing and flashing installations are watertight.
 - 1) Cost of retesting is Contractor's responsibility.
 - d. Testing agency shall prepare survey report of initial scan indicating locations of entrapped moisture if any.
 - E. Inspection Reports: Submit roofing system manufacturer's inspection reports for each inspection within 24 hours of visit/inspection.
 - 1. Inspection Reports will include the following information:
 - a. Reference the project drawings and specific project areas and conditions observed.
 - b. Include photographic documentation
 - c. Date, time and ambient temperature during visit
 - d. Progress of the work
 - e. Report to the Owner, Architect in writing any failure or refusal of the contractor to correct unacceptable practices called to the Contractor's attention.
 - F. Repair or remove and replace components of roofing system where inspections indicate that they do not comply with specified requirements.
 - G. Roofing system will be considered defective if it does not pass tests and inspections.
 - 1. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.
- 3.14 PROTECTING AND CLEANING
- A. Protect roofing system from damage and wear during remainder of construction period.
 - 1. When remaining construction does not affect or endanger roofing, inspect roofing system for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.
 - B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.
- 3.15 CLOSE-OUT
- A. A post construction infra-red survey (recorded on film) is required prior to final acceptance of the roof. Any wet areas found must be removed and replaced.

END OF SECTION

SECTION 076200 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Shop fabricated Gutters and downspouts, including brackets and supports.
2. Shop fabricated Scuppers, leader boxes, conductor heads.
3. Shop fabricated formed flashing and counterflashings.
4. Shop fabricated Curtainwall, Translucent Panel Wall System, and Masonry trim.
5. Miscellaneous rooftop and equipment concealed flashings.
6. Manufactured copings, gravel stops, and fascia.

B. Related Requirements:

1. Section 061053 "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking.
2. Section 074216 "Metal Composite Wall Panels" for sheet metal flashing and trim integral with metal wall panels.
3. Section 075216 "SBS Modified Bituminous Membrane Roofing" for installation of sheet metal flashing and trim integral with roofing.
4. Section 077200 "Roof Accessories" for equipment supports and other manufactured roof accessory units.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review construction schedule. Verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review special roof details, roof drainage, roof-penetration flashing, equipment curbs, and condition of other construction that affect sheet metal flashing and trim.
3. Review requirements for insurance and certificates if applicable.
4. Review sheet metal flashing observation and repair procedures after flashing installation.

1.3 ACTION SUBMITTALS

A. Sustainable Design Submittals: Provide Sustainable Design Submittals in Accordance with Section 018113.

1. Building Product Disclosure Requirements: To encourage the use of building products that are working to minimize their environmental and health impacts, provide the following information when available:
 - a. Environmental Product Declaration: Submit with Product-specific Type III or Industry-wide Type III Environmental Product Declaration (EPD).
2. Recycled Content: The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.

3. Regional Materials: Materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles (160 km) of Project Site. If only a fraction of a product or material is extracted/harvested/recovered and manufactured locally, then only that percentage (by weight) shall contribute to the regional value.
- B. Product Data: For the following:
1. Underlayment materials.
 2. Elastomeric sealant.
 3. Butyl sealant.
 4. Epoxy seam sealer.
- C. Shop Drawings: For sheet metal flashing and trim.
1. Include plans, elevations, sections, and attachment details.
 2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled Work.
 3. Include identification of material, thickness, weight, and finish for each item and location in Project.
 4. Include details for forming, including profiles, shapes, seams, and dimensions.
 5. Include project specific details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
 6. Include project specific details of termination points and assemblies.
 7. Include project specific details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction from fixed points.
 8. Include details of roof-penetration flashing.
 9. Include project specific details of special conditions.
 10. Include project specific details of connections to adjoining work.
 11. Detail formed flashing and trim at scale of not less than 3 inches per 12 inches (1:5).
- D. Samples for Verification: For each type of exposed finish.
1. Sheet Metal Flashing: 12 inches (300 mm) long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.
 2. Trim, Metal Closures, Expansion Joints, Joint Intersections, and Miscellaneous Fabrications: 12 inches (300 mm) long and in required profile. Include fasteners and other exposed accessories.
 3. Unit-Type Accessories and Miscellaneous Materials: Full-size Sample.
- 1.4 INFORMATIONAL SUBMITTALS
- A. Qualification Data: For fabricator.
 - B. Product Test Reports: For each product, for tests performed by a qualified testing agency.
 - C. Sample Warranty: For special warranty.
- 1.5 CLOSEOUT SUBMITTALS
- A. Maintenance Data: For sheet metal flashing and trim, and its accessories, to include in maintenance manuals.

- B. Special warranty.

1.6 QUALITY ASSURANCE

- A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.
- B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
 - 1. Build mockup of sheet metal flashing and trim as part of integrated exterior wall mockup as specified in Section 014339 "Mockups."
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations in writing.

1.7 DELIVERY, STORAGE, AND HANDLING

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

1.8 WARRANTY

- A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Delta units when tested in accordance with ASTM D2244.
 - b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General: Sheet metal flashing and trim assemblies, including cleats, anchors, and fasteners, shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.
- B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual: Architectural Metal Flashing, Condensation and Air Leakage Control, and Reroofing" and SMACNA's

"Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

- 1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 SHEET METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.
- B. Aluminum-zinc alloy-coated (Galvalume) Steel Sheet: ASTM A 792/A 792 M, Class AZ50 Grade 50 (Class AZM150, Grade 275), structural steel quality.

- C. Stainless Steel Sheet: ASTM A240/A240M, Type 304, dead soft, fully annealed; with smooth, flat surface.

- 1. Finish: ASTM A480/A480M, No. 2D (dull, cold rolled).

- a. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.

2.3 UNDERLAYMENT MATERIALS

- A. Self-Adhering, High-Temperature Sheet Underlayment: Minimum 30 mils (0.76 mm) thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer in accordance with underlayment manufacturer's written instructions.

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

- a. Carlisle Residential; a division of Carlisle Construction Materials; WIP 300HT.
 - b. GCP Applied Technologies Inc.; Grace Ice and Water Shield HT.
 - c. Henry Company; Blueskin PE200 HT.

- 2. Source Limitations: Obtain underlayment from single source from single manufacturer.

- 3. Low-Temperature Flexibility: ASTM D1970/D1970M; passes after testing at minus 20 deg F (29 deg C) or lower.

- B. Slip Sheet: Rosin-sized building paper, 3 lb/100 sq. ft. (0.16 kg/sq. m) minimum.

2.4 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, solder if applicable, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.

- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.
 - 1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
 - a. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
 - 2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
 - 3. Fasteners for Stainless Steel Sheet: Series 300 stainless steel.
 - C. Solder for Stainless Steel: ASTM B 32, Grade Sn60 or Grade Sn96, with acid flux of type recommended by stainless-steel sheet manufacturer.
 - D. Reglets: Units of type, material, and profile required, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated with factory-mitered and welded corners and junctions and with interlocking counterflashing on exterior face, or same material as reglet
 - 1. Material: Stainless steel 0.019 inch thick
 - 2. Finish: Mill
 - E. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
 - F. Elastomeric Sealant: ASTM C920, elastomeric silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
 - G. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.
 - H. Bituminous Coating: Cold-applied asphalt emulsion in accordance with ASTM D1187/D1187M.
 - I. Asphalt Roofing Cement: ASTM D4586, asbestos free, of consistency required for application.
- 2.5 FABRICATION, GENERAL
- A. Custom fabricate sheet metal flashing and trim to comply with details indicated and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required.
 - 1. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
 - 2. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
 - 3. Verify shapes and dimensions of surfaces to be covered and obtain field measurements for accurate fit before shop fabrication.
 - 4. Form sheet metal flashing and trim to fit substrates without excessive oil-canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
 - 5. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.

- B. Fabrication Tolerances:
 - 1. Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines indicated on Drawings and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.
- C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.
 - 1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with butyl sealant concealed within joints.
 - 2. Use lapped expansion joints only where indicated on Drawings.
- D. Sealant Joints: Where movable, non-expansion-type joints are required, form metal in accordance with cited sheet metal standard to provide for proper installation of elastomeric sealant.
- E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
- F. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard for application, but not less than thickness of metal being secured.
- G. Seams:
 - 1. Soldered Metals: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.
 - 2. Aluminum with Painted or Coated Finishes: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.

2.6 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

- A. Built-in Gutters:
 - 1. Basis of Design Product: Seal-Tite Industrial Gutter IG-2 by Metal-Era
 - 2. Fabricate to cross section required, with riveted and soldered joints, complete with end pieces, outlet tubes, and other special accessories as required.
 - 3. Fabricate in minimum 12-foot-long sections.
 - 4. Fabricate expansion joints and accessories from same metal as gutters unless otherwise indicated.
 - 5. Fabricate gutters with built-in expansion joints per SMACNA figure 1.10. Provide spacing per SMACNA guidelines.
 - 6. Fabricate gutters with gutter-end dam expansion joints at walls per SMACNA figure 1.9.
 - 7. Accessories: Continuous, removable leaf screen with sheet metal frame and hardware cloth screen, Wire-ball downspout strainer.
 - 8. Fabricate from the Following Materials:
 - a. Galvanized Steel Sheet: 24 gauge thick.
 - 9. Provide 1/16" by 2" spacer bars at 24" o.c. attached to gutter only, not to brackets.
 - 10. Fabricate gutter with continuous 1/8" x 1/2" reinforcing bar folded into gutter edge.
 - 11. Provide strap anchors within 6" of each end and at 36" OC max anchored to substrate
 - 12. Miter Joints: Fully welded

- B. Downspouts: Fabricate downspouts to dimensions indicated, complete with mitered elbows. Furnish with metal hangers from same material as downspouts and anchors.
1. Hanger Style: As detailed.
 2. Fabricate from the following materials:
 - a. Aluminum-zinc alloy-coated (Galvalume) Steel Sheet: 24 gauge
 - b. Profile: Smooth, size as indicated on drawings.
 - c. Finish: Shop Painted to match adjacent Gutters, Fascia, and other profiles
- C. Parapet Scuppers: Fabricate scuppers to dimensions required, with closure flange trim to exterior, 4-inch wide wall flanges to interior, and base extending 4 inches beyond cant or tapered strip into field of roof.
- D. Conductor Heads. Fabricate conductor heads with flanged back and stiffened top edge and of dimensions and shape required, complete with outlet tubes and exterior flange trim.
- E. Gutter Fascia: Fabricate in minimum 96-inch- long, but not exceeding 12-foot- long, sections. Fabricate joint plates of same thickness as fascia. Furnish with continuous cleats to support edge of external leg and drill elongated holes for fasteners on interior leg. Miter corners, fasten and seal watertight. Shop fabricate interior and exterior corners.
1. Joint Style: Butted with expansion space and 6-inch- wide, concealed backup plate.
 2. Fabricate from the following material:
 - a. Aluminum-zinc alloy-coated (Galvalume) Steel Sheet: 16 gauge
- F. Manufactured Copings: Fabricate in minimum 96-inch- (2400-mm-) long, but not exceeding 12-foot- (3.6-m-) long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and interior leg. Miter corners, solder or weld watertight. Shop fabricate interior and exterior corners.
1. Basis of Design: Perma-Tite by Metal-Era, Inc., or comparable product.
 2. Joint Style: Butted with expansion space and 6-inch- (150-mm-) wide, concealed backup plate.
 3. Form to dimensions as indicated on drawings
 4. Fabricate from the Following Materials:
 - a. Aluminum-zinc alloy-coated (Galvalume) Steel Sheet: 22 gauge
- G. Base Flashing: Counterflashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:
1. Stainless steel: 0.0156 inch thick
 2. Finish: No 2d (dull)
- H. Counterflashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:
1. Stainless steel: 0.0156 inch thick
 2. Finish: No 2d (dull)
- I. Roof-Penetration Flashing: Fabricate from the following materials:

1. Stainless Steel: 0.019 inch (0.48 mm) thick.

2.7 WALL SHEET METAL FABRICATIONS

- A. Opening Flashings in Frame Construction: Fabricate head, sill, jamb, and similar flashings to extend 4 inches (100 mm) beyond wall openings. Form head and sill flashing with 2-inch (50-mm) high, end dams. Fabricate from the following materials:

1. Stainless steel: 0.0156 inch thick unless otherwise indicated.

- B. Sill Pan flashings at Punched Window Openings: Fabricate sill pan flashings to extent 4 inches beyond wall openings, formed with 2-inch high end dams. Fabricate from the following materials:

1. Stainless steel: 0.0156 inch thick unless otherwise indicated.

- C. Curtain Wall, Translucent Wall Panel System, and Masonry Trim:

1. Form metal items to accurate sizes and configurations as indicated on drawings and otherwise required for proper installation.
2. Unless otherwise indicated on drawings, provide minimum thicknesses below:
 - a. Sill, head, jamb and other miscellaneous trim: 0.125-inches thick plate
 - b. Downspout decorative channel: 0.1875-inches thick plate
3. Color: to match finish of adjacent wall assembly

- D. Through-Wall Flashings: Fabricate in minimum 96-inch- (2400-mm-) long, but not exceeding 12-foot- (3.6-m-) long, sections.

1. Stainless steel: 0.0156 inch thick

2.8 STEEP-SLOPE ROOF SHEET METAL FABRICATIONS

- A. Apron, Step, Cricket, and Backer Flashing, Valley Flashing, Drip Edges, Eave, Rake, Ridge Flashings: Fabricate from the following Materials:

1. Stainless steel: 0.0156 inch thick

2.9 FINISH

- A. Exposed, Painted Surfaces

1. Fluoropolymer Two-Coat System: Factory applied, baked enamel finish with Kynar 500 (70%) resins. Total dry film thickness not less than 1.0 mils, AAMA 621
2. Color:
 - a. Exposed Surfaces: PPG Duranar, color to match adjacent opening system
 - b. Concealed Surfaces: Manufacture's standard coating for concealed surfaces

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION OF UNDERLAYMENT

- A. Self-Adhering, High-Temperature Sheet Underlayment:
 - 1. Install self-adhering, high-temperature sheet underlayment; wrinkle free.
 - 2. Prime substrate if recommended by underlayment manufacturer.
 - 3. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures.
 - 4. 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.
 - 5. Overlap side edges not less than 3-1/2 inches (90 mm). Roll laps and edges with roller.
 - 6. Roll laps and edges with roller.
 - 7. Cover underlayment within 14 days.
- B. Install slip sheet, wrinkle free, over underlayment before installing sheet metal flashing and trim.
 - 1. Install in shingle fashion to shed water.
 - 2. Lapp joints not less than 4 inches (100 mm).

3.3 INSTALLATION, GENERAL

- A. Install sheet metal flashing and trim to comply with details indicated and recommendations of cited sheet metal standard that apply to installation characteristics required unless otherwise indicated on Drawings.
 - 1. Install fasteners, solder if applicable, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
 - 2. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant, as applicable.
 - 3. Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement.
 - 4. Install sheet metal flashing and trim to fit substrates and to result in watertight performance.
 - 5. Install continuous cleats with fasteners spaced not more than 12 inches (300 mm) o.c.
 - 6. Space individual cleats not more than 12 inches (300 mm) apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
 - 7. Install exposed sheet metal flashing and trim with limited oil-canning, and free of buckling and tool marks.
 - 8. Do not field cut sheet metal flashing and trim by torch.
 - 9. Do not use graphite pencils to mark metal surfaces of aluminum sheet.

- B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.
1. Coat concealed side of stainless steel sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
 2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim.
1. Space movement joints at maximum of 10 feet (3 m) with no joints within 24 inches (600 mm) of corner or intersection.
 2. Form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with sealant concealed within joints.
 3. Use lapped expansion joints only where indicated on Drawings.
- D. Fasteners: Use fastener sizes that penetrate wood blocking or sheathing not less than 1-1/4 inches (32 mm) for nails and not less than 3/4 inch (19 mm) for wood screws or penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.
- E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.
- F. Seal joints as required for watertight construction.
1. Use sealant-filled joints unless otherwise indicated.
 - a. Embed hooked flanges of joint members not less than 1 inch (25 mm) into sealant.
 - b. Form joints to completely conceal sealant.
 - c. When ambient temperature at time of installation is between 40 and 70 deg F (4 and 21 deg C), set joint members for 50 percent movement each way.
 - d. Adjust setting proportionately for installation at higher ambient temperatures.
 - 1) Do not install sealant-type joints at temperatures below 40 deg F (4 deg C).
 2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."
- G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter.
1. Pretin edges of sheets with solder to width of 1-1/2 inches (38 mm); however, reduce pretinning where pretinned surface would show in completed Work.
 2. Do not solder aluminum sheet.
 3. Do not use torches for soldering.
 4. Heat surfaces to receive solder, and flow solder into joint.
 - a. Fill joint completely.
 - b. Completely remove flux and spatter from exposed surfaces.

5. Stainless Steel Soldering:
 - a. Tin edges of uncoated sheets, using solder for stainless steel and acid flux.
 - b. Promptly remove acid-flux residue from metal after tinning and soldering.
 - c. Comply with solder manufacturer's recommended methods for cleaning and neutralization.

3.4 INSTALLATION OF ROOF-DRAINAGE SYSTEM

- A. Install sheet metal roof-drainage items to produce complete roof-drainage system in accordance with cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.
- B. Hanging Gutters:
 1. Join sections with riveted and soldered joints.
 2. Provide for thermal expansion.
 3. Attach gutters at eave or fascia to firmly anchor them in position.
 4. Provide end closures and seal watertight with sealant.
 5. Slope to downspouts.
 6. Fasten gutter spacers to front and back of gutter.
 7. Anchor and loosely lock back edge of gutter to continuous cleat or to eave or apron flashing.
 8. Anchor back of gutter that extends onto roof deck with cleats spaced not more than 24 inches (600 mm) apart.
 9. Anchor gutter with gutter brackets or straps spaced not more than 24 inches (600 mm) apart to roof deck unless otherwise indicated, and loosely lock to front gutter bead.
 10. Install gutter with expansion joints at locations indicated on Drawings, but not exceeding, 50 feet (15.2 m) apart. Install expansion-joint caps.
- C. Downspouts:
 1. Join sections with 1-1/2-inch (38-mm) telescoping joints.
 2. Provide hangers with fasteners designed to hold downspouts securely to walls.
 3. Locate hangers at top and bottom and at approximately 60 inches (1500 mm) o.c.
 4. Provide elbows at base of downspout to direct water away from building unless indicated to connect to underground drainage system.
 5. Connect downspouts to underground drainage system where indicated.
- D. Parapet Scuppers: Continuously support scupper, set to correct elevation, and seal flanges to interior wall face, over cants or tapered edge strips, and under roofing membrane.
 1. Anchor scupper assemblies as indicated on Drawings.
 2. Solder joints in solderable metals; seal joints with elastomeric sealant in non-solderable metal.
- E. Conductor Heads: Anchor securely to wall, with elevation of conductor head rim at minimum of 1 inch (25 mm) below scupper discharge.

3.5 INSTALLATION OF ROOF FLASHINGS

- A. Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and cited sheet metal standard.
 1. Provide concealed fasteners where possible, and set units true to line, levels, and slopes.
 2. Install work with laps, joints, and seams that are permanently watertight and weather resistant.

- B. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 4 inches (100 mm) over base flashing. Install stainless steel draw band and tighten.
- C. Counterflashing: Coordinate installation of counterflashing with installation of base flashing.
 - 1. Insert counterflashing in reglets or receivers and fit tightly to base flashing.
 - 2. Extend counterflashing 4 inches (100 mm) over base flashing.
 - 3. Lap counterflashing joints minimum of 4 inches (100 mm).
 - 4. Secure in waterproof manner by means of anchor and washer spaced at 12 inches (300 mm) o.c. along perimeter and 6 inches (150 mm) o.c. at corners areas unless otherwise indicated.
- D. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric or butyl sealant and clamp flashing to pipes that penetrate roof.

3.6 INSTALLATION OF WALL FLASHINGS

- A. Install sheet metal wall flashing to intercept and exclude penetrating moisture in accordance with cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.
- B. Opening Flashings in Frame Construction: Install continuous head, sill, jamb, and similar flashings to extend 4 inches (100 mm) beyond wall openings.

3.7 INSTALLATION TOLERANCES

- A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines indicated on Drawings and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.8 CLEANING

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder.
- C. Clean off excess sealants.

3.9 PROTECTION

- A. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions.
- B. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended in writing by sheet metal flashing and trim manufacturer.
- C. Maintain sheet metal flashing and trim in clean condition during construction.
- D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures, as determined by Architect.

END OF SECTION

SECTION 077200 - ROOF ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Roof curbs.
2. Equipment supports.

B. Related Requirements:

1. Section 076200 "Sheet Metal Flashing and Trim" for shop- and field-formed metal flashing, roof-drainage systems, roof expansion-joint covers, and miscellaneous sheet metal trim and accessories.
2. Division 23 sections for equipment requirements.

1.2 COORDINATION

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

1.3 ACTION SUBMITTALS

A. Product Data: For each type of roof accessory.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For roof accessories.

1. Include plans, elevations, keyed details, and attachments to other work. Indicate dimensions, loadings, and special conditions. Distinguish between plant- and field-assembled work.

C. Samples: For each exposed product and for each color and texture specified, prepared on Samples of size to adequately show color.

D. Delegated-Design Submittal: For [roof curbs] [equipment supports] [and] [walkways] indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Detail mounting, securing, and flashing of roof-mounted items to roof structure. Indicate coordinating requirements with roof membrane system.
2. Wind-Restraint Details: Detail fabrication and attachment of wind restraints. Show anchorage details and indicate quantity, diameter, and depth of penetration of anchors.

1.4 INFORMATIONAL SUBMITTALS

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

1.5 CLOSEOUT SUBMITTALS

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

1.6 WARRANTY

- A. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finishes or replace roof accessories that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Delta E units when tested according to ASTM D2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Finish Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

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

2.2 ROOF CURBS

- A. Roof Curbs: Internally reinforced roof-curb units capable of supporting superimposed live and dead loads, including equipment loads and other construction indicated on Drawings, bearing continuously on roof structure, and capable of meeting performance requirements; with welded or mechanically fastened and sealed corner joints, integral metal cant, and integrally formed deck-mounting flange at perimeter bottom.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AES Industries, Inc.
 - b. Air Balance; MESTEK, Inc.

- c. Conn-Fab Sales, Inc.
 - d. Greenheck Fan Corporation.
- B. Size: Coordinate dimensions with roughing-in information or Shop Drawings of equipment to be supported.
- C. Supported Load Capacity: Coordinate load capacity with information on Shop Drawings of equipment to be supported.
- D. Material: Zinc-coated (galvanized) or steel sheet, 0.064 inch thick.
 - 1. Finish: Two-coat fluoropolymer.
 - 2. Color: As selected by Architect from manufacturer's full range.
- E. Construction:
 - 1. Curb Profile: Manufacturer's standard compatible with roofing system.
 - 2. Fabricate curbs to minimum height of 12 inches above roofing surface unless otherwise indicated.
 - 3. Top Surface: Level top of curb, with roof slope accommodated by sloping deck-mounting flange or by use of leveler frame.
 - 4. Insulation: Factory insulated with 2-inch-thick, polyisocyanurate board.
 - 5. Liner: Same material as curb, of manufacturer's standard thickness and finish.
 - 6. Metal Counterflashing: Manufacturer's standard, removable, fabricated of same metal and finish as curb.

2.3 EQUIPMENT SUPPORTS

- A. Equipment Supports: Internally reinforced metal equipment supports capable of supporting superimposed live and dead loads between structural supports, including equipment loads and other construction indicated on Drawings, spanning between structural supports; capable of meeting performance requirements; with welded [or mechanically fastened and sealed] corner joints, integral metal cant, and integrally formed structure-mounting flange at bottom.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AES Industries, Inc.
 - b. Air Balance; MESTEK, Inc.
 - c. Curbs Plus, Inc.
 - d. J. L. Industries, Inc.; Activar Construction Products Group, Inc.
- B. Size: Coordinate dimensions with roughing-in information or Shop Drawings of equipment to be supported.
- C. Supported Load Capacity: Coordinate load capacity with information on Shop Drawings of equipment to be supported.
- D. Material: Zinc-coated (galvanized) steel sheet, 0.064 inch thick.
 - 1. Finish: Two-coat fluoropolymer.
 - 2. Color: As selected by Architect from manufacturer's full range.

E. Construction:

1. Curb Profile: Manufacturer's standard compatible with roofing system.
2. Insulation: Factory insulated with [1-1/2-inch-thick glass-fiber board insulation.
3. Liner: Same material as equipment support, of manufacturer's standard thickness and finish.
4. Metal Counterflashing: Manufacturer's standard, removable, fabricated of same metal and finish as equipment support.
5. Fabricate equipment supports to minimum height of 12 inches above roofing surface unless otherwise indicated.

2.4 METAL MATERIALS

A. Zinc-Coated (Galvanized) Steel Sheet: ASTM A653/A653M, G90 coating designation.

1. Exposed Coil-Coated Finish: Prepainted by the coil-coating process to comply with ASTM A755/A755M. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - a. Two-Coat Fluoropolymer Finish: AAMA 621. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight.
2. Baked-Enamel or Powder-Coat Finish: After cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat to a minimum dry film thickness of 2 mils.
3. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester-backer finish consisting of prime coat and wash coat, with a minimum total dry film thickness of 0.5 mil.

B. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A792/A792M, AZ50 coated.

1. Factory Prime Coating: Where field painting is indicated, apply pretreatment and white or light-colored, factory-applied, baked-on epoxy primer coat, with a minimum dry film thickness of 0.2 mil.
2. Exposed Coil-Coated Finish: Prepainted by the coil-coating process to comply with ASTM A755/A755M. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - a. Two-Coat Fluoropolymer Finish: AAMA 621. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight.
3. Baked-Enamel or Powder-Coat Finish: After cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat to a minimum dry film thickness of 2 mils.
4. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester-backer finish consisting of prime coat and wash coat, with a minimum total dry film thickness of 0.5 mil.

C. Aluminum Sheet: ASTM B209, manufacturer's standard alloy for finish required, with temper to suit forming operations and performance required.

1. Mill Finish: As manufactured.

2. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

D. Aluminum Extrusions and Tubes: ASTM B221, manufacturer's standard alloy and temper for type of use, finished to match assembly where used; otherwise mill finished.

E. Stainless Steel Sheet and Shapes: ASTM A240/A240M or ASTM A666, Type 304.

F. Steel Shapes: ASTM A36/A36M, hot-dip galvanized according to ASTM A123/A123M unless otherwise indicated.

G. Steel Tube: ASTM A500/A500M, round tube.

H. Galvanized-Steel Tube: ASTM A500/A500M, round tube, hot-dip galvanized according to ASTM A123/A123M.

I. Steel Pipe: ASTM A53/A53M, galvanized.

2.5 MISCELLANEOUS MATERIALS

A. Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.

B. Cellulosic-Fiber Board Insulation: ASTM C208, Type II, Grade 1, thickness as indicated.

C. Glass-Fiber Board Insulation: ASTM C726, 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, thickness as indicated.

D. Polyisocyanurate Board Insulation: ASTM C1289, thickness and thermal resistivity as indicated.

E. Fasteners: Roof accessory manufacturer's recommended fasteners suitable for application and metals being fastened. Match finish of exposed fasteners with finish of material being fastened. Provide nonremovable fastener heads to exterior exposed fasteners. Furnish the following unless otherwise indicated:

1. Fasteners for Zinc-Coated or Aluminum-Zinc Alloy-Coated Steel: Series 300 stainless steel or hot-dip zinc-coated steel according to ASTM A153/A153M or ASTM F2329.
2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
3. Fasteners for Stainless Steel Sheet: Series 300 stainless steel.

F. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, PVC, or silicone or a flat design of foam rubber, sponge neoprene, or cork.

2.6 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

- A. Install roof accessories according to manufacturer's written instructions.
 - 1. Install roof accessories level; plumb; true to line and elevation; and without warping, jogs in alignment, buckling, or tool marks.
 - 2. Anchor roof accessories securely in place so they are capable of resisting indicated loads.
 - 3. Use fasteners, separators, sealants, and other miscellaneous items as required to complete installation of roof accessories and fit them to substrates.
 - 4. Install roof accessories to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.
- B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
 - 1. Coat concealed side of stainless steel roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
 - 2. Underlayment: Where installing roof accessories directly on cementitious or wood substrates, install a course of underlayment and cover with manufacturer's recommended slip sheet.
 - 3. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof accessories for waterproof performance.
- C. Roof Curb Installation: Install each roof curb so top surface is level.
- D. Equipment Support Installation: Install equipment supports so top surfaces are level with each other.

3.3 REPAIR AND CLEANING

- A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing according to ASTM A780/A780M.
- B. Touch up factory-primed surfaces with compatible primer ready for field painting according to Section 099113 "Exterior Painting."
- C. Clean exposed surfaces according to manufacturer's written instructions.
- D. Clean off excess sealants.

- E. Replace roof accessories that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 078413 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Penetrations in fire-resistance-rated walls.
 - 2. Penetrations in horizontal assemblies.
 - 3. Penetrations in smoke barriers.

1.2 ACTION SUBMITTALS

- A. Sustainable Design Submittals: Provide Sustainable Design Submittals in Accordance with Section 018113.
 - 1. Building Product Disclosure Requirements: To encourage the use of building products that are working to minimize their environmental and health impacts, provide the following information when available:
 - a. Environmental Product Declaration: Submit with Product-specific Type III or Industry-wide Type III Environmental Product Declaration (EPD).
 - 2. General Emissions Evaluation: Adhesives and Sealants must be tested and determined compliant in accordance with California Department of Public Health (CDPH) Standard Method v1.2-2017, using the applicable exposure scenario. Show compliance with VOC limits as detailed in Section 01 8113 "VOC Limits". VOC Content Requirement for Wet Applied Products: All adhesives and sealants wet-applied on site must meet the applicable VOC limits of the South Coast Air Quality Management District (SCAQMD) Rule 1168, effective October 6, 2017
- B. Product Data: For each type of product.
- C. Product Schedule: For each penetration firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing and inspecting agency.
 - 1. Engineering Judgments: Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping system, submit illustration, with modifications marked, approved by penetration firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly. Obtain approval of authorities having jurisdiction prior to submittal.

1.3 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each penetration firestopping system.

1.4 CLOSEOUT SUBMITTALS

- A. Installer Certificates: From Installer indicating that penetration firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.5 QUALITY ASSURANCE

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics:
 - 1. Perform penetration firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
 - 2. Test per testing standards referenced in "Penetration Firestopping Systems" Article. Provide rated systems complying with the following requirements:
 - a. Penetration firestopping systems shall bear classification marking of UL in its "Fire Resistance Directory."

2.2 PENETRATION FIRESTOPPING SYSTEMS

- A. Penetration Firestopping Systems: Select and provide systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated, for each penetration condition in fire-resistance rated construction assemblies. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.
- B. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).
 - 1. F-Rating: Not less than the fire-resistance rating of constructions penetrated.
- C. Penetrations in Horizontal Assemblies: Penetration firestopping systems with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).
 - 1. F-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated.
 - 2. T-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
 - 3. W-Rating: Provide penetration firestopping systems showing no evidence of water leakage when tested according to UL 1479.
- D. Penetrations in Smoke Barriers: Penetration firestopping systems with ratings determined per UL 1479, based on testing at a positive pressure differential of 0.30-inch wg (74.7 Pa).
 - 1. L-Rating: Not exceeding 5.0 cfm/sq. ft. (0.025 cu. m/s per sq. m) of penetration opening at and no more than 50-cfm (0.024-cu. m/s) cumulative total for any 100 sq. ft. (9.3 sq. m) at both ambient and elevated temperatures.
- E. Exposed Penetration Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, per ASTM E 84.

- F. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping system manufacturer and approved by qualified testing and inspecting agency for conditions indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.
- B. Install penetration firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications.
- C. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings.
 - 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not forming permanent components of firestopping.
- D. Install fill materials by proven techniques to produce the following results:
 - 1. Fill voids and cavities formed by openings, forming materials, accessories and penetrating items to achieve required fire-resistance ratings.
 - 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 - 3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.2 IDENTIFICATION

- A. Wall Identification: Permanently label walls containing penetration firestopping systems with the words "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS," using lettering not less than 3 inches (76 mm) high and with minimum 0.375-inch (9.5-mm) strokes.
 - 1. Locate in accessible concealed floor, floor-ceiling, or attic space at 15 feet (4.57 m) from end of wall and at intervals not exceeding 30 feet (9.14 m).
- B. Penetration Identification: Identify each penetration firestopping system with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) of penetration firestopping system edge so labels are visible to anyone seeking to remove penetrating items or firestopping systems. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
 - 1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
 - 2. Contractor's name, address, and phone number.
 - 3. Designation of applicable testing and inspecting agency.

4. Date of installation.
5. Manufacturer's name.
6. Installer's name.

3.3 FIELD QUALITY CONTROL

- A. Inspecting Agency: Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E 2174.
- B. Where deficiencies are found or penetration firestopping system is damaged or removed because of testing, repair or replace penetration firestopping system to comply with requirements.
- C. Proceed with enclosing penetration firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

END OF SECTION

SECTION 078443 - JOINT FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Joints in or between fire-resistance-rated constructions.
 - 2. Joints in smoke barriers.

1.2 ACTION SUBMITTALS

- A. Sustainable Design Submittals: Provide Sustainable Design Submittals in Accordance with Section 018113.
 - 1. Building Product Disclosure Requirements: To encourage the use of building products that are working to minimize their environmental and health impacts, provide the following information when available:
 - a. Environmental Product Declaration: Submit with Product-specific Type III or Industry-wide Type III Environmental Product Declaration (EPD).
 - 2. General Emissions Evaluation: Adhesives and Sealants must be tested and determined compliant in accordance with California Department of Public Health (CDPH) Standard Method v1.2-2017, using the applicable exposure scenario. Show compliance with VOC limits as detailed in Section 01 8113 "VOC Limits". VOC Content Requirement for Wet Applied Products: All adhesives and sealants wet-applied on site must meet the applicable VOC limits of the South Coast Air Quality Management District (SCAQMD) Rule 1168, effective October 6, 2017
- B. Product Data: For each type of product.
- C. Product Schedule: For each joint firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing agency.
 - 1. Engineering Judgments: Where Project conditions require modification to a qualified testing agency's illustration for a particular joint firestopping system condition, submit illustration, with modifications marked, approved by joint firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

1.3 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each joint firestopping system.

1.4 CLOSEOUT SUBMITTALS

- A. Installer Certificates: From Installer indicating that joint firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with UL's "Qualified Firestop Contractor Program Requirements."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

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

2.2 JOINT FIRESTOPPING SYSTEMS

- A. Joint Firestopping Systems: Select and provide systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which joint firestopping systems are installed, for each condition in fire-resistance rated construction assemblies. Joint firestopping systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases.
- B. Joints In or Between Fire-Resistance-Rated Construction: Provide joint firestopping systems with ratings determined per ASTM E 1966 or UL 2079.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. 3M Fire Protection Products.
 - b. A/D Fire Protection Systems Inc.
 - c. BlazeFrame Industries.
 - d. Grabber Construction Products.
 - e. Hilti, Inc.
 - f. Metal-Lite.
 - g. Nelson Firestop; a brand of Emerson Industrial Automation.
 - h. NUCO Inc.
 - i. Passive Fire Protection Partners.
 - j. RectorSeal.
 - k. Roxul Inc.
 - l. Specified Technologies, Inc.
 - m. Thermafiber, Inc.; an Owens Corning company.
 - n. Tremco, Inc.
 - 2. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of the wall, floor, or roof in or between which it is installed.

- C. Joints in Smoke Barriers: Provide fire-resistive joint systems with ratings determined per UL 2079 based on testing at a positive pressure differential of 0.30-inch wg (74.7 Pa).
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. 3M Fire Protection Products.
 - b. A/D Fire Protection Systems Inc.
 - c. Hilti, Inc.
 - d. Nelson Firestop; a brand of Emerson Industrial Automation.
 - e. NUCO Inc.
 - f. Passive Fire Protection Partners.
 - g. RectorSeal.
 - h. Roxul Inc.
 - i. Specified Technologies, Inc.
 - j. Thermafiber, Inc.; an Owens Corning company.
 - k. Tremco, Inc.
 - 2. L-Rating: Not exceeding 5.0 cfm/ft. (0.00775 cu. m/s x m) of joint at both ambient and elevated temperatures.
- D. Exposed Joint Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.
- E. Accessories: Provide components of fire-resistive joint systems, including primers and forming materials, that are needed to install elastomeric fill materials and to maintain ratings required. Use only components specified by joint firestopping system manufacturer and approved by the qualified testing agency for conditions indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

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

2. Apply elastomeric fill materials so they contact and adhere to substrates formed by joints.
3. For elastomeric fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.2 IDENTIFICATION

- A. Joint Identification: Identify joint firestopping systems with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) of joint edge so labels are visible to anyone seeking to remove or joint firestopping system. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
 1. The words "Warning - Joint Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
 2. Contractor's name, address, and phone number.
 3. Designation of applicable testing agency.
 4. Date of installation.
 5. Manufacturer's name.
 6. Installer's name.

3.3 FIELD QUALITY CONTROL

- A. Inspecting Agency: Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E 2393.
- B. Where deficiencies are found or joint firestopping systems are damaged or removed due to testing, repair or replace joint firestopping systems so they comply with requirements.
- C. Proceed with enclosing joint firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

END OF SECTION

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Silicone joint sealants.
2. Nonstaining silicone joint sealants.
3. Urethane joint sealants.
4. Mildew-resistant joint sealants.
5. Butyl joint sealants.
6. Latex joint sealants.
7. Acoustical joint sealants.
8. Removal of existing joint sealants and backer materials, cleaning and preparing joint surfaces for installation of new sealants and backings.

B. Related Requirements:

1. Section 079100 "Preformed Joint Seals" for preformed compressible foam and precured joint seals.
2. Section 321373 "Site Joint Sealants" for sealants in exterior joints in traffic surfaces.

1.2 PREINSTALLATION MEETINGS

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

1.3 ACTION SUBMITTALS

- ##### A. Sustainable Design Submittals: Provide Sustainable Design Submittals in Accordance with Section 018113.

1. Building Product Disclosure Requirements: To encourage the use of building products that are working to minimize their environmental and health impacts, provide the following information when available:
 - a. Environmental Product Declaration: Submit with Product-specific Type III or Industry-wide Type III Environmental Product Declaration (EPD).
2. General Emissions Evaluation: Adhesives and Sealants must be tested and determined compliant in accordance with California Department of Public Health (CDPH) Standard Method v1.2-2017, using the applicable exposure scenario. Show compliance with VOC limits as detailed in Section 01 8113 "VOC Limits". VOC Content Requirement for Wet Applied Products: All adhesives and sealants wet-applied on site must meet the applicable VOC limits of the South Coast Air Quality Management District (SCAQMD) Rule 1168, effective October 6, 2017

B. Product Data:

1. Joint-sealants.
2. Joint sealant backing materials.

- C. Samples for Initial Selection: Manufacturer's standard color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- D. Samples for Verification: For each type and color of joint sealant required, provide Samples with 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 exposed surfaces adjacent to joint sealants.
- E. Joint-Sealant Schedule: Prepare a diagram or plan to indicate joint-sealant locations; marked-up copy of Contract Documents may be used. Include the following information:
 - 1. Joint-sealant application, joint location, and designation.
 - 2. Joint-sealant manufacturer and product name.
 - 3. Joint-sealant formulation.
 - 4. Joint-sealant color.

1.4 INFORMATIONAL SUBMITTALS

- A. Test and Evaluation Reports:
 - 1. Preconstruction Laboratory Test Schedule: Include the following information for each joint sealant and substrate material to be tested:
 - a. Joint-sealant location and designation.
 - b. Manufacturer and product name.
 - c. Type of substrate material.
 - d. Proposed test.
 - e. Number of samples required.
 - 2. Preconstruction Laboratory Test Reports: For each joint sealant and substrate material to be tested from sealant manufacturer, indicating the following:
 - a. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
 - b. Interpretation of test results and written recommendations for primers and substrate preparation are needed for adhesion.
 - 3. 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.
- B. Field Quality-Control Submittals:
 - 1. Field-Adhesion-Test Reports: For each sealant application tested.
- C. Sample warranties.

1.5 CLOSEOUT SUBMITTALS

- A. Warranty Documentation:
 - 1. Manufacturers' special warranties.
 - 2. Installer's special warranties.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Authorized representative who is trained and approved by manufacturer.
- B. Testing Agency Qualifications: Qualified in accordance with ASTM C1021 to conduct the testing indicated.

1.7 MOCKUPS

- A. Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.

1.8 PRECONSTRUCTION TESTING

- A. Preconstruction Laboratory Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
 - 1. Adhesion Testing: Use ASTM C794 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
 - 2. Compatibility Testing: Use ASTM C1087 to determine sealant compatibility when in contact with glazing and gasket materials.
 - 3. Stain Testing: Use ASTM C1248 to determine stain potential of sealant when in contact with stone or masonry substrates.
 - 4. Submit manufacturer's recommended number of pieces of each type of material, including joint substrates, joint-sealant backings, and miscellaneous materials.
 - 5. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
 - 6. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures, including use of specially formulated primers.
 - 7. Testing will not be required if joint-sealant manufacturers submit data that are based on previous testing, not older than 24 months, of sealant products for adhesion to, staining of, and compatibility with joint substrates and other materials matching those submitted.
- B. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates as follows:
 - 1. Locate test joints where indicated on Project or, if not indicated, as directed by Architect.
 - 2. Conduct field tests for each kind of sealant and joint substrate.
 - 3. Notify Architect seven days in advance of dates and times when test joints will be erected.
 - 4. Arrange for tests to take place with joint-sealant manufacturer's technical representative present.
 - a. Test Method: Test joint sealants in accordance with Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1.1 in ASTM C1193 or Method A, Tail Procedure, in ASTM C1521.
 - 1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

5. Report whether sealant failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
6. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

1.9 FIELD CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F (5 deg C).
 2. When joint substrates are wet.
 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
 4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.10 WARRANTY

- A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 1. Warranty Period: 2 years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 1. Warranty Period: 10 years from date of Substantial Completion.
- C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
 1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
 2. Disintegration of joint substrates from causes exceeding design specifications.
 3. Mechanical damage caused by individuals, tools, or other outside agents.
 4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain joint sealants from single manufacturer for each sealant type.

2.2 JOINT SEALANTS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- B. Acoustical Joint Sealants: Provide acoustical joint-sealant products that effectively reduce airborne sound transmission through perimeter joints and openings in building construction, as demonstrated by testing representative assemblies according to ASTM E 90.
- C. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.3 SILICONE JOINT SEALANTS

- A. Silicone, S, NS, 100/50, NT: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 100/50, Use NT.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. GE Construction Sealants; SCS2700 SilPruf LM.
 - b. Sika Corporation U.S.; Sikasil WS-290 or Sikasil WS-290 FPS.
- B. Silicone, S, NS, 50, NT: Single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 50, Use NT.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. GE Construction Sealants; Momentive Performance Materials Inc.; SCS2000 SilPruf.
 - b. Pecora Corporation; 896-TBS or PCS.
 - c. Sika Corporation; Joint Sealants; Sikasil WS-295 or Sikasil WS-295 FPS.
 - d. The Dow Chemical Company; Dow Corning® 791 Silicone Weatherproofing Sealant.

2.4 NONSTAINING SILICONE JOINT SEALANTS

- A. Nonstaining Joint Sealants: No staining of substrates when tested in accordance with ASTM C1248.
- B. Silicone, Nonstaining, S, NS, 100/50, NT: Nonstaining, single-component, nonsag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 100/50, Use NT.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Pecora Corporation; Pecora 890FTS/TXTR.
 - b. Sika Corporation; Joint Sealants; Sikasil WS-290 or Sikasil WS-290 FPS.
 - c. Tremco Incorporated; Spectrem 1.
- C. Silicone, Nonstaining, S, NS, 50, NT: Nonstaining, single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 50, Use NT.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. GE Construction Sealants; Momentive Performance Materials Inc.; Silpruf NB.
 - b. Pecora Corporation; Pecora 864NST, Pecora 895NST, or Pecora 898NST.
 - c. Sika Corporation; Joint Sealants; Sikasil WS-295.
 - d. The Dow Chemical Company; DOW CORNING® 756 SMS BUILDING SEALANT or Dow Corning® 795 Silicone Building Sealant.
 - e. Tremco Incorporated; Spectrem 2 or Spectrem 3.

2.5 URETHANE JOINT SEALANTS

- A. Urethane, S, NS, 25, NT: Single-component, nonsag, nontraffic-use, plus 25 percent and minus 25 percent movement capability, urethane joint sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Pecora Corporation; Dynatrol I-XL.
 - b. Sherwin-Williams Company (The); Stampede-1 or Stampede-TX.
 - c. Tremco Incorporated; Dymonic.
- B. Urethane, S, P, 25, T, NT: Single-component, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type S, Grade P, Class 25, Uses T and NT.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Pecora Corporation; NR-201.
 - b. Polymeric Systems, Inc; Flexiprene 952.
 - c. Sherwin-Williams Company (The); Stampede 1SL.
- C. Urethane, M, NS, 50, NT: Multicomponent, nonsag, plus 50 percent and minus 50 percent movement capability nontraffic-use, urethane joint sealant; ASTM C920, Type M, Grade NS, Class 50, Use NT.
 1. Basis-of-Design Product: Subject to compliance with requirements, provide Pecora Corporation ; Dynatrol II.
- D. Urethane, M, NS, 25, T, NT: Multicomponent, nonsag, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type M, Grade NS, Class 25, Uses T and NT.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Bostik, Inc; Chem-Calk 505.
 - b. Master Builders Solutions; MasterSeal NP 2 (Pre-2014: Sonolastic NP2).
 - c. Pecora Corporation; Dynatred.
 - d. Sika Corporation; Joint Sealants; Sikaflex 2c NS EZ Mix.

2.6 MILDEW-RESISTANT JOINT SEALANTS

- A. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.

- B. Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT.

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

- a. GE Construction Sealants; Momentive Performance Materials Inc.; SCS1700 Sanitary.
- b. Pecora Corporation; Pecora 860.
- c. The Dow Chemical Company; DOW CORNING® 786 SILICONE SEALANT.
- d. Tremco Incorporated; Tremsil 200.

2.7 BUTYL JOINT SEALANTS

- A. Butyl-Rubber-Based Joint Sealants: ASTM C1311.

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

- a. Bostik, Inc; Chem-Calk 300.
- b. Pecora Corporation; BC-158.

2.8 LATEX JOINT SEALANTS

- A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C834, Type OP, Grade NF.

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

- a. Pecora Corporation; AC-20, AVW-920, or Tilt-Seal.
- b. Sherwin-Williams Company (The); 850A Siliconized Acrylic Latex Caulk, 950A Siliconized Acrylic Latex Caulk, White, or PowerHouse Siliconized Acrylic Latex Sealant.
- c. Tremco Incorporated; Tremflex 834.

2.9 ACOUSTICAL JOINT SEALANTS

- A. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex acoustical sealant complying with ASTM C834.

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

- a. GE Construction Sealants; Momentive Performance Materials Inc.; RCS20 Acoustical.
- b. Hilti, Inc.; CP 506 Smoke and Acoustical Sealant.
- c. Pecora Corporation; AC-20 FTR or AIS-919.
- d. Serious Energy Inc.; Quiet Seal Pro.
- e. Specified Technologies, Inc.; SpecSeal Smoke 'N' Sound Sealant.
- f. Tremco Incorporated; Tremco Acoustical Sealant.
- g. USG Corporation; SHEETROCK Acoustical Sealant.

2.10 JOINT-SEALANT BACKING

- A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Adfast; Adseal BR 2600.
 - b. Alcot Plastics Ltd.; ALCOT Soft Type Backer Rod or ALCOT Standard Backer Rod.
 - c. Construction Foam Products; a division of Nomaco, Inc.
 - d. Master Builders Solutions; MasterSeal 920 & 921.

- B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), Type B (bicellular material with a surface skin), or either of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.11 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.

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

3.2 PREPARATION

- A. Preparing Existing Joints: Completely remove existing sealant, backing materials and other joint fillers from all exterior and interior joints within Contract limits.

- B. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.

2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
 - a. Concrete.
 - b. Masonry.
 - c. Unglazed surfaces of ceramic tile.
3. Remove laitance and form-release agents from concrete.
4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
 - a. Metal.
 - b. Glass.
 - c. Porcelain enamel.
 - d. Glazed surfaces of ceramic tile.

- C. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- D. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 1. Do not leave gaps between ends of sealant backings.
 2. Do not stretch, twist, puncture, or tear sealant backings.
 3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Double Line of Sealant: At locations indicated, provide double line of joint sealant to comply with the following:

1. Sequencing: Install inner line of sealant and allow to cure as recommended by manufacturer, but not less than 16 hours.
2. Maintain not less than 1/2-inch continuous gap or cavity between inner and outer lines of sealant and joint backing materials.
3. Where gap between inner and outer lines of sealant is interrupted, continue inner line to seal bottom of cavity and weep to exterior.

G. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical joint sealant. Install acoustical joint sealants at both faces of partitions, at perimeters, and through penetrations. Comply with ASTM C 919, ASTM C 1193, and manufacturer's written recommendations for closing off sound-flanking paths around or through assemblies, including sealing partitions to underside of floor slabs above acoustical ceilings.

H. Acoustical Ceiling Areas: Apply acoustical joint sealant at perimeter edge moldings of acoustical ceiling areas in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.

I. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile in accordance with Figure 8A in ASTM C1193 unless otherwise indicated.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Tests and Inspections:

1. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:
 - a. Extent of Testing: Test completed and cured sealant joints as follows:
 - 1) Perform 10 tests for the first 1000 ft. (300 m) of joint length for each kind of sealant and joint substrate.
 - 2) Perform one test for each 1000 ft. (300 m) of joint length thereafter or one test per each floor per elevation.

- b. Test Method: Test joint sealants in accordance with Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C1193 or Method A, Tail Procedure, in ASTM C1521.
 - 1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
 - c. Inspect tested joints and report on the following:
 - 1) Whether sealants filled joint cavities and are free of voids.
 - 2) Whether sealant dimensions and configurations comply with specified requirements.
 - 3) Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion complies with sealant manufacturer's field-adhesion hand-pull test criteria.
 - d. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant material, sealant configuration, and sealant dimensions.
 - e. 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.
 - 2. 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.
 - C. Prepare test and inspection reports.
- 3.5 CLEANING
 - A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.
- 3.6 PROTECTION
 - A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.
- 3.7 JOINT-SEALANT SCHEDULE
 - A. Exterior joints in vertical surfaces and horizontal nontraffic surfaces:

1. Joint Locations:
 - a. Construction joints in cast-in-place concrete.
 - b. Control and expansion joints in unit masonry.
 - c. Joints between different materials listed above.
 - d. Perimeter joints between materials listed above and frames of doors, windows and other glazing systems, and louvers.
 - e. Control and expansion joints in ceilings and other overhead surfaces.
 - f. Other joints as indicated on Drawings.
 2. Joint Sealant: Silicone, nonstaining, S, NS, 100/50 or 50, NT.
- B. Interior joints in horizontal traffic surfaces:
1. Joint Locations:
 - a. Isolation joints in cast-in-place concrete slabs.
 - b. Control and expansion joints in tile flooring.
 - c. Other joints as indicated on Drawings.
 2. Joint Sealant: Urethane, S, P, 25, T, NT; or Urethane, M, NS, 25, T, NT.
- C. Joint-Sealant Application: Interior perimeter joints between wall materials and frames of storefronts, window walls, skylights, and other exterior glazing systems.
1. Joint Sealant: Silicone S, NS, 100/50 or 50, NT.
- D. Interior joints in vertical surfaces and horizontal nontraffic surfaces:
1. Joint Locations:
 - a. Control and expansion joints on exposed interior surfaces of exterior walls.
 - b. Tile control and expansion joints.
 - c. Vertical joints on exposed surfaces of unit masonry and concrete walls and partitions.
 - d. Other joints as indicated on Drawings.
 2. Joint Sealant: Urethane, S, NS, 25, NT.
- E. Interior joints in vertical surfaces and horizontal nontraffic surfaces not subject to significant movement:
1. Joint Locations:
 - a. Control joints on exposed interior surfaces of exterior walls.
 - b. Perimeter joints between interior wall surfaces and frames of interior doors, glazed openings, and elevator entrances.
 - c. Other joints as indicated on Drawings.
 2. Joint Sealant: Acrylic latex.
- F. Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces:
1. Joint Locations:

- a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
 - b. Tile control and expansion joints where indicated.
 - c. Other joints as indicated on Drawings.
 - 2. Joint Sealant: Silicone, mildew resistant, acid curing, S, NS, 25, NT.
- G. Concealed mastics:
- 1. Joint Locations:
 - a. Aluminum thresholds.
 - b. Sill plates.
 - c. Other joints as indicated on Drawings.
 - 2. Joint Sealant: Butyl-rubber based.
- H. Interior acoustical joints in vertical surfaces and horizontal nontraffic surfaces.
- 1. Joint Location:
 - a. Acoustical joints where indicated.
 - b. Other joints as indicated.
 - 2. Joint Sealant: Acoustical sealant.

END OF SECTION

SECTION 079500 - EXPANSION JOINT ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

A. Work Results:

1. Expansion joints at roof membrane terminations.
2. Expansion joints within exterior walls.
3. Expansion joints within interior floors, walls and ceilings.

B. Principal Products:

1. Metal expansion joints.
2. Elastomeric seal expansion joints.
3. Extruded compression seal expansion joints.
4. Cellular foam compression seal expansion joints.

1.2 REFERENCES

A. Reference Standards:

1. American Architectural Metals Association (AAMA):
 - a. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.
 - b. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.
2. American Society of Civil Engineers/Structural Engineering Institute (ASCE/SEI):
 - a. ASCE/SEI 7 - Minimum Design Loads For Buildings and Other Structures.
3. ASTM International (ASTM):
 - a. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
 - b. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
 - c. ASTM D 1187/D 1187M - Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal.
 - d. ASTM E 1612/E 1612M - Standard Specification for Preformed Architectural Compression Seals for Buildings and Parking Structures.
 - e. ASTM E 1783/E 1783M - Standard Specification for Preformed Architectural Strip Seals for Buildings and Parking Structures.
 - f. ASTM E 1966 - Standard Test Method for Fire-Resistive Joint Systems
4. Underwriters Laboratories (UL):

- a. UL 2079 - Standard for Safety for Tests for Fire Resistance of Building Joint Systems.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meetings: Conduct meeting at Project site, minimum two weeks before starting installation.

1.4 SUBMITTALS

- A. Product Data: Submit for each expansion joint type.
- B. Shop Drawings:
 - 1. Show installation details including splices, terminations, and attachment.
 - 2. Include diagram showing entire length of each joint.
- C. Samples:
 - 1. Submit color charts for color selection.
 - 2. Submit full size by 6 inches (150 mm) long samples for each type of elastomeric seals, extruded compression seals and cellular foam compression seals.
- D. Test and Evaluation Reports: Document fire barrier performance in fire rated joints.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers:
 - 1. Basis-of-Design: MM Systems Corporation, or comparable equal.
 - 2. Contact: Mark Kennedy Construction Sales Group Ph:215-321-5300
- B. Source Limitations: Obtain expansion joints from single manufacturer.

2.2 PERFORMANCE / DESIGN CRITERIA

- A. Fire Resistance: UL 2079 or ASTM E 1966 tested for specified ratings.
- B. Smoke Resistance: UL 2079 tested; 5 cfm/linear foot (0.00775 cu m/s m) maximum air leakage.
- C. Thermal Resistance: Withstand minimum 150 degrees F (83 degrees C) ambient and 180 degrees F (100 degrees C) surface temperature ranges.
- D. Seismic Movement: Withstand remain functional after ASCE/SEI 7 design earthquake movement.

2.3 EXTERIOR EXPANSION JOINTS

- A. Roof-to-Wall: Aluminum cover plate secured to wall; secondary moisture barrier; surface mounted aluminum frame for mounting to roof curb
 - 1. Product: MM Systems Corporation, RX-W Series
 - 2. Joint Width: As noted on drawings
- B. Wall-to-Wall: Cellular foam compression seal.
 - 1. Product: MM Systems Corporation, SIF Series
 - 2. Joint Width: As noted on drawings

2.4 INTERIOR EXPANSION JOINTS

- A. Wall-to-Wall: Elastomeric seal flush with adjacent wall finish; concealed aluminum frame for mounting between adjacent walls
 - 1. Product: MM Systems Corporation, SIF
 - 2. Joint Width as noted on drawings
- B. Wall-to-Ceiling: Elastomeric seal flush with adjacent ceiling finish; concealed aluminum frame for mounting to adjacent wall and ceiling suspension system.
 - 1. Product: MM Systems Corporation, VSS-I
 - 2. Joint Width: as noted on drawings

2.5 MATERIALS

- A. Extruded Aluminum: ASTM B 221; manufacturer's standard alloy and temper.
- B. Sheet and Plate Aluminum: ASTM B 209; manufacturer's standard alloy and temper.
- C. Elastomeric Seals: ASTM E 1783/E 1783M; formed to fit to metal frames; color as selected from manufacturer's standard
- D. Extruded Compression Seals: ASTM E 1612/E 1612M; PVC, multi-cellular internal construction; color as selected from manufacturer's standard
- E. Cellular Foam Compression Seals: Silicone faced extruded foam; color as selected from manufacturer's standard.
- F. Fire Barrier: Manufacturer's standard meeting specified fire resistance.
- G. Secondary Moisture Barrier: Manufacturer's standard waterproof membrane to resist moisture penetration to building interior.
- H. Sealant: ASTM C 920, silicone; type recommended by expansion joint manufacturer; color matching expansion joint face.

- I. Installation Accessories: Manufacturer's standard for completing installation.

2.6 FINISHES

- A. Concealed Aluminum: Mill finish.
- B. Exposed Aluminum:
 - 1. Interior Joints: AAMA 611, Class I; clear anodized.
 - 2. Exterior Joints: [AAMA 611, Class I; clear anodized.] [AAMA 2605; 70 percent PVDF resin, [2 coat] [2 coat mica] [3 coat metallic] finish.]

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine building joints and expansion joint installation substrates.
- B. Ensure building joints are properly sized and configured.

3.2 PREPARATION

- A. Remove contaminants from expansion joint substrates.

3.3 INSTALLATION

- A. Common Installation Requirement: See Section 017300.
- B. Install expansion joints according to manufacturer's instructions.
- C. Metal Frames:
 - 1. Attach frames to joint substrates, aligned for uniform joint width and plane relative to adjacent surfaces.
 - 2. Adjust nominal joint width to compensate for building joint width and ambient conditions when installed.
 - 3. Fit frames and cover plates allowing for linear thermal expansion and contraction along length of joint.
 - 4. Shims must be continuous under the entire length of the frame. Shims at anchor points only are not acceptable
- D. Metal Frame Elastomeric Seals:
 - 1. Snap fit seals into metal frames.
 - 2. Use single piece seal for full length of expansion joint between change in direction and change in plane.

- E. Extruded Compression Seals: Install seals under continuous compression within joints flush with adjacent surface.
- F. Cellular Foam Compression Seals: Install seals under continuous compression within joints flush with recessed below adjacent surface. Apply fillet sealant bead to face of compression seal and adjacent joint surface.
- G. Terminate expansion joints by manufacturer's standard device or technique finish exposed ends.
- H. Install continuous fire barrier with fire resistance rated expansion joints.
- I. Install continuous secondary moisture barrier at exterior expansion joints. Seal end joints in moisture barrier, watertight. Connect drain tubing to membrane and extend tubing to discharge water at observable location at building exterior or floor drain.

3.4 PROTECTION

- A. Protect expansion joints from construction operations damage.

END OF SECTION

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Interior steel doors and frames.
2. Exterior steel doors and frames.
3. Interior steel borrowed lite frames

B. Related Requirements:

1. Section 081119 "Stainless-Steel Doors and Frames" for hollow-metal doors and frames manufactured from stainless steel.
2. Section 087100 "Door Hardware" for door hardware for hollow-metal doors.
3. Section 088000 "Glazing" for interior glazing in door panels and borrowed lites

1.2 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

1.3 COORDINATION

- A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.
- B. Coordinate requirements for installation of door hardware, electrified door hardware, and access control and security systems.

1.4 ACTION SUBMITTALS

- A. Sustainable Design Submittals: Provide Sustainable Design Submittals in Accordance with Section 018113.
1. Building Product Disclosure Requirements: To encourage the use of building products that are working to minimize their environmental and health impacts, provide the following information when available:
 - a. Environmental Product Declaration: Submit with Product-specific Type III or Industry-wide Type III Environmental Product Declaration (EPD).
 2. Recycled Content: The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.
 3. Regional Materials: Materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles (160 km) of Project Site. If only a fraction of a product or material is extracted/harvested/recovered and manufactured locally, then only that percentage (by weight) shall contribute to the regional value.

- B. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, core descriptions, fire-resistance ratings, and finishes.
- C. Sustainable Design Submittals:
 - 1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
- D. Shop Drawings: Include the following:
 - 1. Elevations of each door type.
 - 2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
 - 3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 - 4. Locations of reinforcement and preparations for hardware.
 - 5. Details of each different wall opening condition.
 - 6. Details of electrical raceway and preparation for electrified hardware, access control systems, and security systems.
 - 7. Details of anchorages, joints, field splices, and connections.
 - 8. Details of accessories.
 - 9. Details of moldings, removable stops, and glazing.
- E. Product Schedule: For hollow-metal doors and frames, prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final door hardware schedule.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For door inspector.
 - 1. Fire-Rated Door Inspector: Submit documentation of compliance with NFPA 80, Section 5.2.3.1.
- B. Product Test Reports: For each type of fire-rated hollow-metal door and frame assembly, for tests performed by a qualified testing agency indicating compliance with performance requirements.
- C. Field quality control reports

1.6 QUALITY ASSURANCE

- A. Fire-Rated Door Inspector Qualifications: Inspector for field quality control inspections of fire-rated door assemblies shall meet the qualifications set forth in NFPA 80, section 5.2.3.1.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow-metal doors and frames palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
 - 1. Provide additional protection to prevent damage to factory-finished units.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

- C. Store hollow-metal doors and frames vertically under cover at Project site with head up. Place on minimum 4-inch- (102-mm-) high wood blocking. Provide minimum 1/4-inch (6-mm) space between each stacked door to permit air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Amweld International, LLC
 - 2. Ceco Door; ASSA ABLOY.
 - 3. Curries Company; ASSA ABLOY.
 - 4. Greensteel Industries, Ltd.
 - 5. North American Door Corp.
 - 6. Pioneer Industries.
 - 7. Republic Doors and Frames.
 - 8. Steelcraft; an Allegion brand.

2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
 - 1. Smoke- and Draft-Control Assemblies: Provide assemblies with gaskets listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.

2.3 INTERIOR STEEL DOORS AND FRAMES

- A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Doors and Frames:
 - 1. Doors:
 - a. Extra Heavy Duty Doors: ANSI/SDI A250.8, Level 3
 - b. Type: As indicated in the Door and Frame Schedule.
 - c. Thickness: 1-3/4 inches (44.5 mm).
 - d. Face: Uncoated steel sheet, minimum thickness of 0.053 inch (1.0 mm).
 - e. Edge Construction: Model 2, Seamless
 - f. Core: Manufacturer's standard vertical steel stiffener. Spacs between stiffeners shall be filled with fiberglass batt-type material
 - g. Fire-Rated Core: Manufacturer's standard vertical steel stiffener.
 - 2. Frames:
 - a. Maximum Heavy Duty: ANSI/SDI A250.8, Level 4: NAAMM-HMMA 861, SDI A250.4 Physical Performance Level A

- b. Materials: Uncoated steel sheet, minimum thickness of 0.053 inch (at openings 4'-0" or less. At openings greater than 4'-0", minimum thickness shall be 0.067".
 - c. Sidelite and Transom Frames: Fabricated from same thickness material as adjacent door frame.
 - d. Construction: Full profile welded.
 - 3. Exposed Finish: Prime.
- 2.4 EXTERIOR STEEL DOORS AND FRAMES
- A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
 - B. Maximum-Duty Doors and Frames: ANSI/SDI A250.8, Level 4; ANSI/SDI A250.4, Level A
 - 1. Doors:
 - a. Type: As indicated in the Door and Frame Schedule.
 - b. Thickness: 1-3/4 inches (44.5 mm).
 - c. Face: Metallic-coated steel sheet, minimum thickness of 0.067 inch, with minimum G60 or A60 (ZF180) coating.
 - d. Edge Construction: Model 2, Seamless.
 - e. Top Edge Closures: Close top edges of doors with flush closures of same material as face sheets. Seal joints against water penetration.
 - f. Bottom Edges: Close bottom edges of doors with end closures or channels of same material as face sheets. Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape.
 - g. Core: Manufacturer's standard, unless otherwise indicated.
 - 2. Frames:
 - a. Materials: Metallic-coated steel sheet, minimum thickness of 0.067 inch (1.3 mm), with minimum A60 (ZF180) coating.
 - b. Construction: Full profile welded.
 - 3. Exposed Finish: Prime.
- 2.5 BORROWED LITES
- A. Fabricate of metallic-coated steel sheet, minimum thickness of 0.053 inch
 - B. Construction: Full profile welded.
 - C. Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as metal as frames.
 - D. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
- 2.6 FRAME ANCHORS
- A. Jamb Anchors:

1. Type: Anchors of minimum size and type required by applicable door and frame standard, and suitable for performance level indicated.
 2. Quantity: Minimum of three anchors per jamb, with one additional anchor for frames with no floor anchor. Provide one additional anchor for each 24 inches (610 mm) of frame height above 7 feet (2.1 m).
 3. Postinstalled Expansion Anchor: Minimum 3/8-inch- (9.5-mm-) diameter bolts with expansion shields or inserts, with manufacturer's standard pipe spacer.
- B. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor.
- C. Floor Anchors for Concrete Slabs with Underlayment: Adjustable-type anchors with extension clips, allowing not less than 2-inch (51-mm) height adjustment. Terminate bottom of frames at top of underlayment.
- D. Glazed Lites: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with mitered hairline joints.
1. Provide stops and moldings flush with face of door, and with square stops unless otherwise indicated.
 2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
 3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames. Provide loose stops and moldings on inside of hollow-metal doors and frames.
 4. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.
 5. Provide stops for installation 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 (51 mm) o.c. from each corner.
- E. Material: ASTM A 879/A 879M, Commercial Steel (CS), 04Z (12G) coating designation; mill phosphatized.
1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M; hot-dip galvanized according to ASTM A 153/A 153M, Class B.

2.7 MATERIALS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 20 percent.
- B. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- C. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- D. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.
- E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- F. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.

- G. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

2.8 FABRICATION

- A. Hollow-Metal Frames: Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as frames.
 - 1. Sidelite and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by welding.
 - 2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 - 3. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
 - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
 - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- B. Hardware Preparation: Factory prepare hollow-metal doors and frames to receive templated mortised hardware, and electrical wiring; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.
 - 1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
 - 2. Comply with BHMA A156.115 for preparing hollow-metal doors and frames for hardware.

2.9 STEEL FINISHES

- A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
 - 1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 - EXECUTION

3.1 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. Touch up factory-applied finishes where spreaders are removed.
- B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.2 INSTALLATION

- A. General: Install hollow-metal doors and frames plumb, rigid, properly aligned, and securely fastened in place. Comply with approved Shop Drawings and with manufacturer's written instructions.
- B. Hollow-Metal Frames: Comply with SDI A250.11.
 - 1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces without damage to completed Work.
 - a. Where frames are fabricated in sections, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces. Touch-up finishes.
 - b. Install frames with removable stops located on secure side of opening.
 - 2. Fire-Rated Openings: Install frames according to NFPA 80.
 - 3. Floor Anchors: Secure with postinstalled expansion anchors.
 - a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
 - 4. Solidly pack mineral-fiber insulation inside frames unless otherwise indicated.
 - 5. In-Place Concrete Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
 - 6. Installation Tolerances: Adjust hollow-metal frames 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. Hollow-Metal Doors: Fit and adjust hollow-metal doors accurately in frames, within clearances specified below.
 - 1. Non-Fire-Rated Steel Doors: Comply with SDI A250.8.
 - 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
 - 3. Smoke-Control Doors: Install doors according to NFPA 105.

3.3 FIELD QUALITY CONTROL

- A. Inspection Agency: Engage a qualified inspector to perform inspections and to furnish reports to Architect.
- B. Inspections:
 - 1. Fire-Rated Door Inspections: Inspect each fire-rated door according to NFPA 80, Section 5.2.
- C. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.

- D. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.
- E. Prepare and submit separate inspection report for each fire-rated door assembly indicating compliance with each item listed in NFPA 80.

3.4 CLEANING AND TOUCHUP

- A. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- B. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION

SECTION 081119 – STAINLESS STEEL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

- 1. Stainless-steel doors and frames

B. Related Requirements:

- 1. Section 042000 "Unit Masonry" for Mortar: Grout fill of metal frames.
- 2. Section 079200 "Joint Sealants" for Sealing of joints between masonry and frames. Sealing of glazing.
- 3. Section 081113 "Hollow Metal Doors and Frames" for hollow-metal doors and frames manufactured from steel.
- 4. Section 087100 "Door Hardware" for door hardware for stainless steel doors.

1.2 PRODUCTS

- A. Stainless steel metal doors, swinging type, with fire rating as indicated on drawings.

1.3 REFERENCES

NOTE: The publications listed in this section form a part of this specification to the extent referenced. The publications are referenced in the text by basic designation only. Contractor/Supplier/Installer should comply with the referenced standard. When a more recent standard may be considered, Contractor/Supplier/Installer shall request the Philadelphia Parks and Recreation Department's approval.

A. Standards Agencies:

ANSI	American National Standards Institute, Inc., 1430 Broadway Avenue, New York, New York 10018.
ASTM	American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, Pennsylvania 19428.
NAAMM	National Association of Architectural Metal Manufacturers, 600 South Federal Street, Chicago, Illinois 60605.
NFPA	National Fire Protection Association 1 Batterymarch Park P.O. Box 9101 Quincy, MA 02269
UL	Underwriters Laboratory, 333 Pfingsten Road, Northbrook, Illinois 60062.

B. Standards:

1. ANSI A250.4-2011, Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Hardware Reinforcings
2. ANSI/NAAMM HMMA 801-12, Glossary of Terms for Hollow Metal Doors and Frames
3. ANSI/NFPA 80 -2015, 16th Edition, Standard for Fire Doors and Fire Windows
4. ANSI/NFPA 252-2017, Standard Methods of Fire Tests of Door Assemblies
5. ANSI/UL 10B-2009, Fire Tests of Door Assemblies, 9th edition
6. ANSI/UL 10C-2016, Positive Pressure Fire Test of Door Assemblies, 1st Edition
7. ASTM B117-16 Method of Salt Spray (Fog) Testing.
8. ASTM C 143/C 143M-15a, Test Method for Slump of Hydraulic-Cement Concrete
9. ASTM D1735-14, Practice for Testing Water Resistance of Coating Using Water Fog Apparatus.
10. NAAMM HMMA 802-07, Manufacturing of Hollow Metal Doors and Frames
11. NAAMM HMMA 803-08, Steel Tables
12. NAAMM HMMA 810-08, Hollow Metal Doors
13. NAAMM HMMA 810 TN01-03, Defining Undercuts
14. NAAMM HMMA 820-87, Hollow Metal Frames
15. NAAMM HMMA 820 TN01-03, Grouting Hollow Metal Frames
16. NAAMM HMMA 820 TN02-03, Continuously Welded
17. NAAMM HMMA 830-02, Hardware Selection for Hollow Metal Doors and Frames
18. NAAMM HMMA 831-11, Recommended Hardware Locations for Hollow Metal Doors and Frames
19. ANSI/NAAMM HMMA 866 Commercial Stainless Steel Doors and Frames
20. NAAMM HMMA 840-16, Guide Specification for Installation and Storage of Hollow Metal Doors and Frames
21. NAAMM HMMA 850-14, Fire-Rate Hollow Metal Doors and Frames

1.4 COORDINATION

- A. Coordinate anchorage installation for stainless steel frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors.
- B. Coordinate requirements for installation of door hardware, electrified hardware, and access control and security system
- C. Coordinate requirements for installation of glazing.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference combined with Hollow Metal Doors and Frames Preinstallation Conference: Conduct conference at the Project Site.

1.6 TESTING AND PERFORMANCE

- A. Performance Test for Steel Doors and Hardware Reinforcements (ANSI A151.1)
- B. The test specimen shall be a 3' - 0" x 7' - 0" nominal size 1¾" door.
- C. The specimen shall be tested in accordance with the ANSI A151.1 procedure for the Level "A" doors (1,000,000 cycles).
 1. The specimen shall be tested in accordance with the ANSI A151.1 procedure for twist test which requires a maximum pressure of 300 lbs. pressure.

- D. All test reports shall include a description of the test specimen, procedures used in testing, and indicate compliance with the acceptance criteria of the test.
- E. Labeled Fire-Rated Doors and Frame Product.
 - 1. Doors, frames, transom frames and sidelight assemblies provided for openings requiring fire, temperature rise, shall be listed and/or classified and bear the label of a testing agency having a factory inspection service. The product shall be tested in accordance with ANSI/NFPA 252 or ANSI/UL-10B, ANSI, UL-10C and constructed as listed or classified for labeling. Fire, temperature rise and/or smoke and draft control ratings shall be determined and scheduled by the Architect.
 - 2. If any door or frame product specified by the Architect to be fire-rated cannot qualify for labeling because of design, hardware or any other reason, the Architect shall be so advised in the submittal documents. If hardware, glazing, or other options affect the fire-rating and are unknown at the time of submittal document preparation, the architect shall be advised.

1.7 QUALITY ASSURANCE

- A. Manufacturer's Qualifications.
 - 1. Manufacturer shall provide evidence of having personnel and plant equipment capable of fabricating stainless steel door and frame assemblies of the type specified herein.
- B. Installer Qualifications
 - 1. Installer, trained by the primary product manufacturer, with a minimum of five (5) years documented experience installing stainless steel doors and frame assemblies similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- C. Quality Criteria.
 - 1. All door and frame assemblies shall meet the requirements of Paragraph 1.8 of these specifications.
 - 2. Fire labeled doors and frames shall be provided for those openings requiring fire protection ratings as determined and scheduled by the Architect and as required by the applicable Building Code. Such doors and frames shall be constructed as tested in accordance with ASTM E152 (UL-10B) and approved by Underwriters Laboratories or other recognized testing agencies having a factory inspection service.
 - 3. If any door or frame specified by the Architect to be fire-rated cannot qualify for appropriate labeling because of its design, hardware or any other reason, the Architect shall be so advised before fabricating work on that item is started.
 - 4. Fabrication methods and product quality shall meet the standards set by the Hollow Metal Manufacturers Association, HMMA, a Division of the National Association of Architectural Manufacturers, NAAMM, as set forth in these specifications.

1.8 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include construction details, material descriptions, core descriptions, fire-resistance ratings, and finishes.
 - 1. Sustainable Design Submittals: Provide Sustainable Design Submittals in Accordance with Section 018113.
 - 1. Building Product Disclosure Requirements: To encourage the use of building products that are working to minimize their environmental and health impacts, provide the following information when available:

- a. Environmental Product Declaration: Submit with Product-specific Type III or Industry-wide Type III Environmental Product Declaration (EPD).
2. Recycled Content: The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.
3. Regional Materials: Materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles (160 km) of Project Site. If only a fraction of a product or material is extracted/harvested/recovered and manufactured locally, then only that percentage (by weight) shall contribute to the regional value.

B. Shop Drawings: Include the following:

1. Elevations of each door type.
2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of electrical raceway and preparation for electrified hardware, access control systems, and security systems.
7. Details of anchorages, joints, field splices, and connections.
8. Details of accessories.

C. Samples for Initial Selection: For stainless steel doors and frames.

1. Samples for Verification (No work to be fabricated until samples are approved):
2. Finishes: For each type of exposed finish required, prepared on Samples of not less than 3 by 5 inches (75 by 127 mm).
3. Fabrication: Prepare Samples approximately 8 by 10 inches (203 by 254 mm) corner section to demonstrate compliance with requirements for quality of materials and construction:
 - a. Doors: Show vertical-edge including welding joint of head to jamb, top, and bottom construction; core construction; and hinge, hinge mortise and other applied hardware reinforcement. Include separate section showing glazing if applicable with glazing stop applied to both head and jamb section to show corner joint.
 - b. Frames: Show profile, corner joint, floor and wall anchors, and silencers. Include separate section showing fixed hollow-metal panels and glazing with stops if applicable.

D. Product Schedule: For stainless steel doors and frames, show each door and opening, prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final door hardware schedule – Show hardware group on schedule. Provide one schedule for the entire project – coordinate schedule for doors and openings of materials specified in other sections.

1.9 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each type of fire-rated stainless steel door and frame assembly, for tests performed by a qualified testing agency.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Deliver stainless steel doors and frames palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use non-vented plastic.

1. Provide additional protection to prevent damage to finished surface of stainless steel units.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store stainless steel doors and frames vertically under cover at Project site with head up. Place on minimum 4-inch- (102-mm-) high wood blocking. Provide minimum 1/4-inch (6-mm) space between each stacked door to permit air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Ceco Door; ASSA ABLOY.
 2. Curries Company; ASSA ABLOY.
 3. Greensteel Industries, Ltd.
 4. Steelcraft; an Allegion brand.

2.2 STAINLESS STEEL DOORS AND FRAMES

- A. Stainless Steel Doors (Extra Heavy-Duty, SDI A250.8, Level 3) and Frames (Maximum Heavy-Duty, SDI A250.8, Level 4): NAAMM-HMMA 866; SDI A250.4, Physical Performance Level A. At locations indicated in the Door and Frame Schedule.
 1. Doors for Highly Corrosive Environments:
 - a. Type: As indicated in the Door and Frame Schedule.
 - b. Thickness: 1-3/4 inches. Doors shall be neat in appearance and free from warping or buckle. Edge bends shall be true and straight and of minimum radius for the thickness of the metal used.
 - c. Face: Face sheets shall be 0.050 in. (1.27 mm) minimum thickness and shall be manufactured from Type 316 stainless steel sheet. Steel shall be free of scale, pitting, coil breaks or surface blemishes, buckles, waves or other defects.
 - d. Edge Construction: Door face sheets shall be joined at their vertical edges by a continuous weld extending the full height of the door with no visible seams on their faces or vertical edges per HMMA-801-83. Joint shall be set toward the center of the vertical edge of the door. A joint at the corner of the door face and the vertical edge is not accepted. The top and bottom edges shall be closed with a continuous channel, also not less than 0.062" (1.59 mm) thickness, welded to both sheets.
 - e. Edge Profiles: Edge profiles shall be provided on both vertical edges of single acting doors as follows: beveled 1/8" in 1 3/4" profile. All hardware for single acting doors shall be designed for beveled edges as specified.
 - f. Core: The door shall be stiffened by continuous vertically formed steel sections which, upon assembly, shall span the full thickness of the interior space between door faces. These stiffeners shall be 0.030" minimum thickness, spaced so that the vertical interior webs shall be no more than 6" apart and securely fastened to both face sheets by spot welds spaced a maximum of 5" o.c. vertically. Spaces between stiffeners shall be filled with fiberglass, batt-type material.
 - g. Fire-Rated Core: Manufacturer's standard vertical steel stiffener core for fire-rated doors.
 - h. Exposed Finish: No. 6, Dull Satin
 2. Frames for Highly Corrosive Environments:

- a. Materials: Type 316 stainless steel sheet. Minimum thickness: In openings 4' - 0" or less, steel shall be 0.062" (1.59 mm) minimum thickness. In openings greater than 4' - 0", steel shall be 0.078" (1.98 mm) minimum thickness.
 - b. Sidelite and Transom Frames: Fabricated from same thickness material as adjacent door frame.
 - c. Construction: Full profile welded.
 - 1) All frames shall have integral stops and be welded units of the sizes and types shown in the contract drawings.
 - 2) Corner joints shall have all contact edges closed tight with miter faces, and either butted or miter stops. Faces and soffits shall be continuously welded and the faces finished smooth. The use of gussets or splice plates as a substitute for welding shall not be acceptable.
 - 3) All other face joints shall be continuously welded and smoothly finished.
 - 4) Minimum depth of stops shall be $\frac{5}{8}$ ". Cut-off stops, where shown, shall be capped at heights as shown in the contract drawings, and jamb joints below cut-off stops shall be welded, filled and ground smooth so that there are no visible seams
 - 5) When shipping limitations so dictate, frames for large openings shall be fabricated in sections designated for assembly in the field by others. Alignment plates or angles shall be installed at each joint. Such components shall be the same thickness as the frame. Field joints shall be made in accordance with approved submittal drawings and shall be field welded.
3. Exposed Finish: No. 6, Dull Satin.

2.3 STAINLESS STEEL INFILL PANELS

- A. Provide stainless steel infill panels of same materials, construction, and finish as adjacent stainless steel door assemblies.

2.4 FRAME ANCHORS

- A. Jamb Anchors:

1. Masonry Type:

- a. Frames for installation in new masonry walls shall be provided with adjustable jamb anchors of the same material as the frame. Acceptable jamb anchors shall be TEE-strap or strap and stirrup type no less than 0.075" thickness, or wire type no less than 0.185" in diameter. Straps shall be no less than 2" x 10" in size, corrugated and/or perforated. All frames in new masonry shall be filled with grout. The number of anchors provided on each jamb shall be as follows:
 - 1) Frames up to 60" ..., 2 anchors.
 - 2) Frames greater than 60" up to 90" ..., 3 anchors.
 - 3) Frames greater than 90" up to 96" ..., 4 anchors
 - 4) Frames greater than 96", 4 anchors plus 1 for each 24" or fraction thereof over 96" spaced at 24" maximum between anchors (U.L. fire ratings may require additional anchors. Verify building and local code requirements, the most stringent will apply).
- b. Frames for installation in existing masonry or concrete walls shall be prepared for stainless steel expansion bolt type anchors. The preparation shall consist of a countersunk hole for a $\frac{3}{8}$ " diameter bolt and a spacer from the unexposed surface of the frame to the wall. The spacer shall be welded to the frame and spaced a maximum of 6" from the top and bottom, with intermediate spacing at a maximum of 26" o.c. Fasteners for such anchors shall be stainless steel provided by Installer. All frames installed in exterior openings shall be filled with grout.

2. Dry Wall Type:
 - a. Frames for installation in stud partitions shall be provided with steel anchors of suitable design, no less than 0.048" thickness, securely welded inside each jamb. The number of anchors provided on each jamb shall be as follows:
 - 1) Frames up to 60" ..., 3 anchors.
 - 2) Frames greater than 60" up to 90" ..., 4 anchors.
 - 3) Frames greater than 90" up to 96" ..., 5 anchors.
 - 4) Frames greater than 96", 5 anchors plus 1 for each 24" or fraction thereof over 96" spaced at 24" maximum between anchors (U.L. fire ratings may require additional anchors. Verify building and local code requirements, the most stringent will apply).
 3. Quantity: Minimum of three anchors per jamb, with one additional anchor for frames with no floor anchor. Provide one additional anchor for each 24 inches (610 mm) of frame height above 7 feet (2.1 m).
 4. Post-installed Expansion Anchor: Minimum 3/8-inch- (9.5-mm-) diameter bolts with expansion shields or inserts, with manufacturer's standard pipe spacer.
- B. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor.
 1. Floor anchors with two holes for fasteners shall be fastened inside jambs with at least four (4) spot welded per anchor.
 2. Where so scheduled for finish floor underlayment thickness, adjustable floor anchors, providing no less than 2" height adjustment, shall be fastened in place with at least four (4) spot welds per anchor. Terminate bottom of frames at top of underlayment.
 3. Floor anchors shall be of the same material as the frame, with a minimum of 0.078" thickness.
- C. Material: stainless steel sheet – same type as door face.

2.5 MATERIALS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent
- B. Stainless Steel Sheet: ASTM A 240/A 240M, austenitic stainless-steel, Type 316.
- C. Steel Sheet: ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, commercial steel, Type B.
- D. Metallic-Coated Steel Sheet: ASTM A653/A 653M, commercial steel, with minimum G60 (Z180) or A60 (ZF180) metallic coating.
- E. Foam-Plastic Insulation: Manufacturer's standard polystyrene board insulation with maximum flame- spread and smoke-developed indexes of 75 and 450, respectively, according to ASTM 84. Enclose insulation completely within door.
- F. Mineral-Fiber Insulation: Insulation made of rock-wool fibers, slag-wool fibers, or glass fibers.
- G. Inserts, Bolts, and Fasteners: Stainless Steel where noted, otherwise, Hot-dip galvanized according to ASTM A 153/A 153M.
- H. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow- metal frames of type indicated.

- I. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
- J. Glazing: Comply with requirements in Section 088000 "Glazing."
- K. Grout: Comply with ASTM C 476, with a slump of not more than 4 inches (102) as measured according to ASTM C 143/C 143M.

2.6 FABRICATION

- A. Door Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch (19 mm) beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.
- B. Stainless Steel Frames: Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as frames.
 - 1. Sidelite and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by welding
 - 2. Provide stainless steel countersunk sheet metal screws spaced uniformly not more than 9 inches (230 mm) o.c. and not more than 2 inches (51 mm) o.c. from each corner for exposed fasteners unless otherwise indicated.
 - 3. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
 - a. Single-Door Frames: Drill stop in strike jamb to receive three doorsilencers.
 - b. Double-Door Frames: Drill stop in head jamb to receive two doorsilencers.
 - 4. Terminated Stops: Terminate stops [6 inches (152 mm)] <Insert dimension> above finish floor with a [45] [90]-degree angle cut, and close open end of stop with steel sheet closure. Cover opening in extension of frame with welded-steel filler plate, with welds ground smooth and flush with frame.
 - 5. Frames for installation in masonry wall openings more than 4' - 0" in width shall have an angle or channel stiffener made from the same material as the frame that shall be factory welded into the head when the head is to be grouted. Such stiffener shall not be used as lintel or load bearing member, shall not be longer than the opening width but not shorter than 1" and they shall not be less than 0.105" in thickness.
 - 6. Plaster guards shall be provided and welded in place at all hardware mortises on frames to be set in masonry or concrete openings. They shall be made from the same material as the frame with not less than 0.019" thickness.
 - 7. Where specified or scheduled, Stainless Steel Infill Panels will be secured flush to the outside of exterior frames or flush to the secure side of interior frames. The Infill Panels will be anchored to the frame sections with loose stops and moldings on inside or non-secure side of Stainless Steel frames. Provide stops for installation with stainless steel countersunk sheet metal screws spaced uniformly not more than 9 inches (230 mm) o.c. and not more than 2 inches (51 mm) o.c. from each corner.
- C. Hardware Preparation: Factory prepare hollow-metal doors and frames to receive templated mortised hardware, and electrical wiring; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.
 - 1. Comply with BHMA A156.115 for preparing stainless steel doors and frames for hardware.
 - 2. Where non-templated, mortised, and surface-mounted door hardware is to be applied, reinforce doors and frames, with all drilling and tapping done in the field, to receive:
 - a. Minimum thickness for hardware reinforcements in doors as follows:

- 1) Full mortise hinges and pivots, 0.180".
- 2) Reinforcements for lock fronts, concealed holders, or surface mounted closer, 0.105".
- 3) Internal reinforcements for all other surface applied hardware 0.075".

b. Minimum thickness for hardware reinforcements in frames as follows:

- 1) Hinge and pivot reinforcements ..., 0.195" x 1¼" >10" in length.
- 2) Strike reinforcements ..., 0.105"
- 3) Closer reinforcements ..., 0.105"
- 4) Flush bolt reinforcements ..., 0.105"
- 5) Reinforcements for surface applied hardware ..., 0.105"
- 6) Reinforcements for hold open arms ..., 0.105"
- 7) Reinforcements for surface panic devices ..., 0.105"

3. In cases where electrically operated hardware is required, and indicated on architectural door schedule, conduit, hardware enclosures and/or junction boxes within the door shall be provided. Access plates where required shall be the same thickness as the door and fastened with a minimum of (4) #8-32 Stainless Steel machine screws or #6 Stainless Steel metal screws, not to exceed 12" o.c.

2.7 STAINLESS STEEL FINISHES

- A. Stainless Steel Finishes: Remove tool and die marks and stretch lines, or blend into finish. Grind and polish surfaces to produce uniform finish, free of cross scratches. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
- B. Finish: No. 6, Dull Satin.
- C. Grain Direction: For finishes exhibiting grain, run grain vertically on door faces and frame jambs.

2.8 CLEARANCES AND TOLERANCES

- A. Edge clearances for swinging doors shall not exceed the following
 1. Between doors and frames, at head and jambs ..., $\frac{3}{16}$ ".
 2. Between edges of pairs of doors ..., $\frac{1}{16}$ "
 3. At door sills where a threshold is used ..., $\frac{3}{8}$ ". Measured from bottom of door to top of threshold.
 4. At door sills where no threshold is used ..., $\frac{3}{4}$ ".
 5. Between door bottom and nominal surface of floor coverings at fire rated openings as provided in NFPA 80-990, Paragraph 2.5.5.
- B. Manufacturing tolerances: Fabricate frames to tolerances indicated in NAAMM-HMMA 866; tolerances shall be maintained within the following limits:
 1. Frames for single door or pair of doors:
 - a. Thickness of sheet metal ..., +0.015"; —0.007".
 - b. Width, measured between rabbets at the head. Nominal opening width ..., + $\frac{1}{16}$ "; — $\frac{1}{32}$ ".
 - c. Height (total length of jamb rabbet). Nominal opening height ..., + $\frac{3}{64}$ ".
 - d. Cross sectional profile dimensions.
 - 1) Face ..., + $\frac{1}{32}$ ".
 - 2) Stop ..., $\pm \frac{1}{32}$ ".
 - 3) Rabbet ..., + $\frac{1}{32}$ ".

- 4) Depth ..., + $\frac{1}{32}$ ".
- 5) Throat ..., $\pm \frac{1}{16}$ ". Frames overlapping walls to have throat dimension $\frac{1}{8}$ " greater than dimensioned wall thickness to accommodate irregularities in wall construction.

2. Doors:

- a. Thickness of sheet metal ... +0.015"; -0.007".
- b. Width ..., + $\frac{3}{64}$ "
- c. Height ..., + $\frac{3}{64}$ "
- d. Thickness ..., + $\frac{1}{16}$ "
- e. Hardware cutout dimensions. Template dimensions ..., +0.015"; -0"
- f. Hardware location ..., + $\frac{1}{32}$ "

2.9 HARDWARE LOCATIONS

1. The location of hardware on doors and frames shall be coordinated with the locations indicated in Specification Section 087100 Door Hardware.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Remove wraps or covers from doors and frames upon delivery at the building site. Record any damage or error in the stainless steel doors and frames delivered to the job site, and notify the manufacturer/supplier on writing to maintain warranty and/or fire label
- B. Promptly clean and touch up any scratches or disfigurement caused in shipping or handling.
- C. 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. Check doors and frames for correct size, swing, fire rating and opening number.
- D. Store door and frame materials in a dry location on planks at least 4" off ground or 2" off floor slab. Doors shall be stored in a vertical position and spaced at least $\frac{3}{8}$ " by wood strip or blocking. Materials shall be covered to protect them from damage but in such a manner as to permit air circulation. Place no more than 5 doors or welded frames in a group. In the case of multi-opening frames, no more than three units should be stored in a group, to avoid serious racking or other damage to the bottom of the frame
- E. Drill and tap doors and frames to receive non-templated, mortised, and surface-mounted doorhardware.

3.2 INSTALLATION

- A. General: Install stainless steel doors and frames plumb, rigid, properly aligned, and braced securely until permanent anchors are set. Comply with approved Shop Drawings and with manufacturer's written instructions.
- B. The installer shall perform the following:
 1. Prior to installation, the area of floor on which the frame product is to be installed, and within the path of the door swing, shall be checked for flatness.
 2. Prior to installation, all interior surfaces of perimeter frame product sections to be installed in masonry or concrete walls shall be isolated and protected from grout and antifreeze agents.
- C. Doors and frame product shall be checked for correct size, swing, fire rating and opening number. Permissible installation tolerances shall not exceed the following:

1. Squareness, $\pm 1/16$ " measured on a line, 90 degrees from one jamb, at the upper corner of the frame at the other jamb.
2. Squareness, $\pm 1/16$ " measured on a line, 90 degrees from one jamb, at the upper corner of the frame at the other jamb.
3. Twist, $\pm 1/16$ " measured at face corners of jambs on parallel lines perpendicular to the plane of the wall.
4. Plumbness, $+1/16$ " measured on the jamb at the floor.

D. Stainless Steel Frames: Comply with NAAMM-HMMA 840.

1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces without damage to completed Work.
 - a. Where frames are fabricated in sections, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces. Touch-up finishes.
 - b. Install frames with removable stops located on secure side of opening.
2. Floor Anchors: Secure with postinstalled expansion anchors.
 - a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
3. Hardware must be applied in accordance with hardware manufacturer's templates and instructions.
4. Plaster guards and junction boxes are intended to protect hardware mortises and tapped mounting holes from masonry grout of 4" maximum slump consistency which is hand troweled in place. If a light consistency grout (greater than 5" slump when tested in accordance with ASTM C 143/C 143M) is to be used, special precautions must be taken in the field by the installation contractor to protect the aforementioned.
5. Frame products are not intended or designed to act as forms for grout or concrete. Grouting of hollow metal sections shall be done in "lifts" or precautions shall be otherwise taken by the contractor to ensure that frames are not deformed or damaged by the hydraulic forces that occur during this process.
6. Any grout or other bonding material shall be promptly cleaned off of frames or doors following installation. Hollow metal surfaces shall be kept free of grout, tar, or other bonding material or sealer.
7. In-Place Concrete or Masonry Construction: Secure frames in place with post-installed expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
8. Exposed hollow metal surfaces which have been scratched or otherwise marred during installation, cleaning, and/or field welding, shall promptly be finished smooth, cleaned, treated for maximum paint adhesion and touched up with a rust inhibitive primer comparable to and compatible with the shop applied primer and finish paint specified in Section 099000.

E. Stainless steel Doors: Fit and adjust hollow-metal doors accurately in frames, within clearances specified below.

1. Non-Fire-Rated Steel Doors: Comply with NAAMM-HMMA 841 and NAAMM-HMMA guide specification indicated.
2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
3. Smoke-Control Doors: Install doors according to NFPA 105.

3.3 ADJUSTING AND CLEANING

- A. Clean grout and other bonding material off stainless steel doors and frames immediately after installation.
- B. Stainless Steel Touchup: Immediately after erection, smooth any scratched or damaged areas of stainless steel; polish to match undamaged finish.

END OF SECTION

SECTION 083100 - ACCESS DOORS AND PANELS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Access doors and frames for walls and ceilings.
 - 2. Louvered access doors for crawl spaces
 - 3. Insulated draft-stop attic access door
- B. Provide access doors where required for access to concealed equipment, in sizes and locations as approved by Architect.
- C. Related Requirements:
 - 1. Section 092900 "Gypsum Board."
 - 2. Section 093000 "Ceramic Tiling."

1.2 ACTION SUBMITTALS

- A. Sustainable Design Submittals: Provide Sustainable Design Submittals in Accordance with Section 018113.
 - 1. Building Product Disclosure Requirements: To encourage the use of building products that are working to minimize their environmental and health impacts, provide the following information when available:
 - a. Environmental Product Declaration: Submit with Product-specific Type III or Industry-wide Type III Environmental Product Declaration (EPD).
 - 2. Recycled Content: The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.
 - 3. Regional Materials: Materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles (160 km) of Project Site. If only a fraction of a product or material is extracted/harvested/recovered and manufactured locally, then only that percentage (by weight) shall contribute to the regional value.
- B. Product Data: For each type of product.
- C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
- D. Samples: For each door face material.
- E. Schedule: Provide complete access door and frame schedule, including types, locations, sizes, latching or locking provisions, and other data pertinent to installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Access Doors and Frames: Units complying with NFPA 80 tested according to the following test methods:
1. NFPA 252 or UL 10B for fire-rated access door assemblies installed vertically.
 2. NFPA 288 for fire-rated access door assemblies installed horizontally.

2.2 PRODUCTS, GENERAL

2.3 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

A. Non-Rated Flush Access Doors for Walls:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Acudor; Access Door - UF-5000, or an approved comparable product.
 - a. Exposed Flange: Provide manufacturer's standard-width exposed flange, proportional to door size, for installation in drywall, masonry, or ceramic tile surfaces.
2. 16 gauge stainless steel door: ASTM A480/A480M No. 4 finish
3. Size: Minimum 24 inch by 24 inch (610 mm by 610 mm) or as indicated.
4. Hinges: Continuous hinge, door panel to be open to 90 degrees
5. Gasket: Dust Seal.
6. Lock: Key operated vandal resistant lock
 - a. Lock Preparation: Prepare door panel to accept cylinder specified in Section 087100 "Door Hardware."

B. Non-Rated Flush Access Doors with Drywall Finish for Ceilings:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Acudoor Access Door - ED-2002, or an approved comparable product.
 - a. Exposed Flange: Provide manufacturer's standard-width exposed flange, proportional to door size, for installation in drywall, masonry, or ceramic tile surfaces.
2. 16 gauge steel door and frame
3. Size: Minimum 24 inch by 24 inch (610 mm by 610 mm) or as indicated.
4. Hinges: Continuous hinge, door panel to be open to 90 degrees
5. Gasket: Dust Seal.
6. Finish: Powder painted; White.
7. Lock: Key operated vandal resistant lock
 - a. Lock Preparation: Prepare door panel to accept cylinder specified in Section 087100 "Door Hardware."

C. Louvered, Non-Rated Flush Access Doors for Crawl Space:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Nystrom Architectural Series Access Door NT/NW, or an approved comparable product.
 - a. Exposed Flange: Provide manufacturer's standard-width exposed flange, proportional to door size, for installation in drywall, masonry, or ceramic tile surfaces.
2. 14 gauge steel door: Primed with Baked Enamel
3. Size: Minimum 48 inch by 48 inch or as indicated.
4. Panel Face: Full Louvers
5. Hinges: Continuous hinge, door panel to be open to 90 degrees
6. Gasket: Dust Seal.
7. Lock: Key operated vandal resistant lock
 - a. Lock Preparation: Prepare door panel to accept cylinder specified in Section 087100 "Door Hardware."

D. Insulated Draft Stop Attic Access Door

1. Exposed Flange: Provide manufacturer's standard-width exposed flange, proportional to door size, for installation in drywall, masonry, or ceramic tile surfaces.
2. 14 gauge steel door: Primed with Baked Enamel
3. Size: Minimum 36 inch by 60 inch or as indicated.
4. Polystyrene Core
5. Hinges: Continuous hinge, door panel to be open to 90 degrees
6. Gasket: Dust Seal.
7. Lock: Key operated vandal resistant lock
 - a. Lock Preparation: Prepare door panel to accept cylinder specified in Section 087100 "Door Hardware."

2.4 MATERIALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Steel Sheet: Uncoated or electrolytic zinc coated, ASTM A 879/A 879M, with cold-rolled steel sheet substrate complying with ASTM A 1008/A 1008M, Commercial Steel (CS), exposed.
- C. Stainless Steel Sheet: ASTM A480/A480M
- D. Aluminum: Bars and Shapes: ASTM B221 (ASTM B 221M), Alloy 6063-T6
- E. Frame Anchors: Same type as door face.
- F. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

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 doors to types of supports indicated.
 - 1. For concealed flanges with drywall bead, provide edge trim for gypsum board securely attached to perimeter of frames.
 - 2. Provide mounting holes in frames for attachment of units to metal framing.
- D. Recessed Access Doors: Form face of panel to provide recess for application of applied finish. Reinforce panel as required to prevent buckling.
- E. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.
 - 1. For cylinder locks, furnish two keys per lock and key all locks alike.
 - 2. For recessed panel doors, provide access sleeves for each locking device. Furnish plastic grommets and install in holes cut through finish.

2.6 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with manufacturer's written instructions for installing access doors and frames.
- B. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

3.2 ADJUSTING

- A. Adjust doors and hardware, after installation, for proper operation.
- B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION

SECTION 083313 - ROLLING COUNTER DOORS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Counter door assemblies.
- B. Related Requirements
 - 1. Section 099123 "Interior Painting" for finish painting of factory-primed doors.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type and size of coiling counter door and accessory.
 - 1. Include construction details, material descriptions, dimensions of individual components, profiles for slats, and finishes.
- B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.
 - 1. Include plans, elevations, sections, and mounting details.
 - 2. Include details of equipment assemblies, and indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
 - 3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
- C. Samples for Verification: For each type of exposed finish on the following components, in manufacturer's standard sizes

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For coiling counter doors to include in maintenance manuals.
- B. Record Documents: For fire-rated doors, list of door numbers and applicable room name and number to which door accesses.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.

1.6 WARRANTY

- A. Manufacturer's standard two-year warranty against defects in material and workmanship

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain coiling counter doors from single source from single manufacturer.

2.2 COUNTER DOOR ASSEMBLY

- A. Counter Door: Coiling counter door formed with curtain of interlocking metal slats.
 - 1. Basis-of-Design: Cookson Model ESC20 with frame and integrated sill assembly
- B. Door Curtain Material: Galvanized steel
- C. 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 A 653, Commercial Quality, galvanized steel with powder coated steel angle bottom bar with continuous lift handle and vinyl astragal
- D. Integral Frame, Hood, and Fascia: Stainless steel.
 - 1. Mounting: Face of wall
- E. Sill Configuration: Integral metal sill
- F. Countertop: Integral 16 gauge AISI 300 series stainless steel formed shape; type 304 #4 finish
- G. Manual Door Operator: Manufacturer's standard crank operator
 - 1. Provide operator with through-wall shaft operation.
 - 2. Provide operator with manufacturer's standard removable operating arm.
- H. Curtain Accessories: Equip door with push/pull handles
- I. Door Finish:
 - 1. Baked-Enamel or Powder-Coated Finish: Color as selected by Architect from manufacturer's full range
 - 2. Interior Curtain-Slat Facing: Match finish of exterior curtain-slat face

2.3 DOOR CURTAIN MATERIALS AND FABRICATION

- A. Door Curtains: Fabricate coiling counter door curtain of interlocking metal slats 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 A653/A653M, with G90 (Z275) zinc coating; nominal sheet thickness (coated) of 0.028 inch (0.71 mm); and as required.
 - 2. Metal Interior Curtain-Slat Facing: Match metal of exterior curtain-slat face.

- B. 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.

2.4 HOODS

- 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 A653/A653M.

2.5 LOCKING DEVICES

- A. Slide Bolt: Fabricate with side-locking bolts to engage through slots in tracks for locking by padlock, located on both left and right jamb sides, operable from coil side.

2.6 CURTAIN ACCESSORIES

- A. Astragal: Equip each door bottom bar with a replaceable, adjustable, continuous, compressible gasket of flexible vinyl, rubber, or neoprene as a cushion bumper.
- B. Push/Pull Handles: Equip each push-up-operated or emergency-operated door with lifting handles on each side of door, finished to match door.

2.7 COUNTER DOOR ACCESSORIES

- A. Integral Metal Sill: Fabricate sills as integral part of frame assembly of Type 304 stainless steel in manufacturer's standard thickness with ASTM A480/A480M No. 4

2.8 COUNTERBALANCE 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, 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. Torsion Rod for Counterbalance Shaft: Fabricate of manufacturer's standard cold-rolled steel, sized to hold fixed spring ends and carry torsional load.
- D. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

2.9 MANUAL DOOR OPERATORS

- A. General: Equip door with manual door operator by door manufacturer.
- B. Push-up Door Operation: Design counterbalance mechanism so that required lift or pull for door operation does not exceed [25 lbf (111 N)]

2.10 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM/NOMMA 500 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.

2.11 STEEL AND GALVANIZED-STEEL FINISHES

- A. Factory Prime Finish: Manufacturer's standard primer, compatible with field-applied finish. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.
- B. 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. Examine substrate areas and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.
- B. Examine locations of electrical connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Install coiling counter doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.
- B. Install coiling counter doors, hoods, controls, and operators at the mounting locations indicated for each door.

3.3 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
 - 1. Complete installation and startup checks according to manufacturer's written instructions.
 - 2. After electrical circuitry has been energized, operate doors to confirm proper motor rotation and door performance.

3. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

3.4 ADJUSTING

- A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.
- B. Lubricate bearings and sliding parts as recommended by manufacturer.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain coiling counter doors.

END OF SECTION

SECTION 084113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Interior storefront framing.
 - 2. Exterior and interior manual-swing entrance doors

1.2 RELATED REQUIREMENTS

- A. Related Requirements:
 - 1. Section 089000 "Glazing" for Interior Entrance Door and Interior Storefront glazing requirements.
 - 2. Section 088856 "Security Glazing" for security glazing requirements in Exterior Entrance Doors in Curtainwall Frames

1.3 ACTION SUBMITTALS

- A. Sustainable Design Submittals: Provide Sustainable Design Submittals in Accordance with Section 018113.
 - 1. Building Product Disclosure Requirements: To encourage the use of building products that are working to minimize their environmental and health impacts, provide the following information when available:
 - a. Environmental Product Declaration: Submit with Product-specific Type III or Industry-wide Type III Environmental Product Declaration (EPD).
 - 2. Recycled Content: The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.
 - 3. Regional Materials: Materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles (160 km) of Project Site. If only a fraction of a product or material is extracted/harvested/recovered and manufactured locally, then only that percentage (by weight) shall contribute to the regional value.
- B. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- C. Shop Drawings: For aluminum-framed entrances and storefronts. Include plans, elevations, sections, full-size details, and attachments to other work.

1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
 2. Include full-size isometric details of each vertical-to-horizontal intersection of aluminum-framed entrances and storefronts, showing the following:
 - a. Joinery, including concealed welds.
 - b. Anchorage.
 - c. Expansion provisions.
 - d. Glazing.
 - e. Flashing and drainage.
 3. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.
- 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 assemblies, made from 12-inch (300-mm) lengths of full-size components and showing details of the following:
 1. Joinery, including concealed welds.
 2. Anchorage.
 3. Expansion provisions.
 4. Glazing.
 5. Flashing and drainage.
- G. Entrance Door Hardware Schedule: Prepared by or under supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.
- H. Delegated-Design Submittal: For aluminum-framed entrances and storefronts indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Energy Performance Certificates: For aluminum-framed entrances and storefronts, accessories, and components, from manufacturer.
 1. Basis for Certification: NFRC-certified energy performance values for each aluminum-framed entrance and storefront.
- C. Product Test Reports: For aluminum-framed entrances and storefronts, for tests performed by manufacturer and witnessed by a qualified testing agency.
- D. Quality-Control Program: Developed specifically for Project, including fabrication and installation, according to recommendations in ASTM C 1401. Include periodic quality-control reports.
- E. Source quality-control reports.

- F. Field quality-control reports.
- G. Sample Warranties: For special warranties.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For aluminum-framed entrances and storefronts to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated and accredited by IAS or ILAC Mutual Recognition Arrangement as complying with ISO/IEC 17025.
- C. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.
 - 1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

1.7 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of aluminum-framed entrances and storefronts that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including, but not limited to, excessive deflection.
 - b. Noise or vibration created by wind and thermal and structural movements.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - d. Water penetration through fixed glazing and framing areas.
 - e. Failure of operating components.
 - 2. Warranty Period: Two years from date of Substantial Completion.
- B. Special Finish Warranty: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design aluminum-framed entrances and storefronts.
- B. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
 1. Aluminum-framed entrances and storefronts shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
 2. Failure also includes the following:
 - a. Thermal stresses transferring to building structure.
 - b. Glass breakage.
 - c. Noise or vibration created by wind and thermal and structural movements.
 - d. Loosening or weakening of fasteners, attachments, and other components.
 - e. Failure of operating units.
- C. Structural Loads:
 1. Wind Loads: As indicated on Drawings.
 2. Other Design Loads: As indicated on Drawings.
- D. Deflection of Framing Members: At design wind pressure, as follows:
 1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane not exceeding 1/175 of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to 3/4 inch (19.1 mm), whichever is less.
 2. Deflection Parallel to Glazing Plane: Limited to amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between
 1. framing members and glazing or other fixed components to less than 1/8 inch (3.2 mm).
 - a. Operable Units: Provide a minimum 1/16-inch (1.6-mm) clearance between framing members and operable units.
- E. Structural: Test according to ASTM E 330 as follows:
 1. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
 2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
 3. Test Durations: As required by design wind velocity, but not less than 10 seconds.

- F. Air Infiltration: Test according to ASTM E 283 for infiltration as follows:
 - 1. Fixed Framing and Glass Area:
 - a. Maximum air leakage of 0.06 cfm/sq. ft. (0.30 L/s per sq. m) at a static-air-pressure differential of 6.24 lbf/sq. ft. (300 Pa).
 - 2. Entrance Doors:
 - a. Pair of Doors: Maximum air leakage of 1.0 cfm/sq. ft. (5.08 L/s per sq. m) at a static-air-pressure differential of 1.57 lbf/sq. ft. (75 Pa).
 - b. Single Doors: Maximum air leakage of 0.5 cfm/sq. ft. (2.54 L/s per sq. m) at a static-air-pressure differential of 1.57 lbf/sq. ft. (75 Pa).

- G. Water Penetration under Static Pressure: Test according to ASTM E 331 as follows:
 - 1. No evidence of water penetration through fixed glazing and framing areas when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft. (300 Pa).
 - 2. Maximum Water Leakage: According to AAMA 501.1. Water leakage does not include water controlled by flashing and gutters, or water that is drained to exterior.
 - 3. Test Performance: Complying with criteria for passing based on building occupancy type when tested according to AAMA 501.4 at design displacement and 1.5 times the design displacement.

- H. Energy Performance: Certify and label energy performance according to NFRC as follows:
 - 1. Condensation Resistance: Fixed glazing and framing areas shall have an NFRC-certified condensation resistance rating of no less than 25 as determined according to NFRC 500.

- I. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes:
 - 1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 INTERIOR STOREFRONT SYSTEM

- A. Basis-of-Design Systems: Kawneer Trifab 451T Storefront System, or comparable product by one of the following:
 - 1. EFCO Series 402 FG
 - 2. YKK YES 40FS

- B. Source Limitations: Obtain all components of aluminum-framed entrance and storefront system, including framing spandrel panels, venting windows and accessories, from single manufacturer.

2.3 FRAMING

- A. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
 - 1. Construction: Manufacturer's standard extruded aluminum expansion mullions
 - 2. Glazing System: Retained mechanically with gaskets on four sides.

3. Glazing Plane: Front.
 4. Finish: High-performance organic finish.
 5. Fabrication Method: Field-fabricated stick system.
- B. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.
- C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with non-staining, nonferrous shims for aligning system components.
- D. Materials:
1. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 - a. Sheet and Plate: ASTM B 209 (ASTM B 209M).
 - b. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).
 - c. Extruded Structural Pipe and Tubes: ASTM B 429/B 429M.
 - d. Structural Profiles: ASTM B 308/B 308M.
 2. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM, and prepare surfaces according to applicable SSPC standard.
 - a. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
 - b. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
 - c. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

2.4 ENTRANCE DOOR SYSTEMS

- A. Basis-of-Design System: Kawneer AA425 Thermal Doors, or comparable product.
1. Door Construction: 1-3/4-inch (44.5-mm) overall thickness, with minimum 0.125-inch-thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.
 - 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
 - a. Vertical face dimension: 4-1/4-inch nominal width.
 - b. Bottom rail dimension: 10"
 3. Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and preformed gaskets.
 - a. Provide nonremovable glazing stops on outside of door.

2.5 ENTRANCE DOOR HARDWARE

- A. Entrance Door Hardware: Hardware not specified in this Section is specified in Section 087100 "Door Hardware."
 - 1. Hardware for aluminum entrances shall be furnished and installed in the doors by the door manufacturer, in coordination with Section "087100 Door Hardware" and shall include:
 - a. Continuous Hinges
 - b. Pulls
 - c. Thresholds
 - d. Complete Weatherstripping
 - e. Removeable Mullions (at door pair locations)

2.6 GLAZING

- A. Glazing: Comply with Section 088000 "Glazing."
- B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.
- C. Glazing Sealants: As recommended by manufacturer.

2.7 AUXILIARY COMPONENTS

- A. Fillers, Trim and Closures: Provide filler panels, trim, cover plates, and other closures, for both exterior and interior conditions as shown, complete with anchors for support to structure. Allow for erection tolerances and provide for movement of storefront due to thermal expansion and building deflections, as indicated.
 - 1. Fabricate fillers, trim and closures from extruded aluminum unless otherwise indicated; fabricate from brake metal where indicated.
 - 2. Exposed Finish: Match storefront framing.

2.8 FABRICATION

- A. Form or extrude aluminum shapes before finishing.
- B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- C. Fabricate components that, when assembled, have the following characteristics:
 - 1. Profiles that are sharp, straight, and free of defects or deformations.
 - 2. Accurately fitted joints with ends coped or mitered.
 - 3. Physical and thermal isolation of glazing from framing members.
 - 4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
 - 5. Provisions for field replacement of glazing from exterior.

- 6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
 - D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.
 - E. Storefront Framing: Fabricate components for assembly using shear-block system.
 - F. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
 - 1. At exterior doors, provide compression weather stripping at fixed stops.
 - 2. At interior doors, provide silencers at stops to prevent metal-to-metal contact. Install three silencers on strike jamb of single-door frames and two silencers on head of frames for pairs of doors.
 - G. Entrance Doors: Reinforce doors as required for installing entrance door hardware.
 - 1. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.
 - 2. At exterior doors, provide weather sweeps applied to door bottoms.
 - H. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.
 - I. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.
- 2.9 ALUMINUM FINISHES
- A. High-Performance Organic Finish: Two-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: PPG UC106695F Sunstorm Café Noir Pearl

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

- A. Prepare surfaces that are in contact with structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.

3.3 INSTALLATION

A. General:

1. Comply with manufacturer's written instructions.
2. Do not install damaged components.
3. Fit joints to produce hairline joints free of burrs and distortion.
4. Rigidly secure nonmovement joints.
5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
6. Seal perimeter and other joints watertight unless otherwise indicated.

B. Metal Protection:

1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Set continuous sill members and flashing in full sealant bed as specified in Section 079200 "Joint Sealants" to produce weathertight installation.

D. Install components plumb and true in alignment with established lines and grades.

E. Install operable units level and plumb, securely anchored, and without distortion. Adjust weather-stripping contact and hardware movement to produce proper operation.

F. Install glazing as specified in Section 088000 "Glazing."

G. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.

1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

3.4 ERECTION TOLERANCES

A. Erection Tolerances: Install aluminum-framed entrances and storefronts to comply with the following maximum tolerances:

1. Plumb: 1/8 inch in 10 feet (3.2 mm in 3 m); 1/4 inch in 40 feet (6.35 mm in 12.2 m).
2. Level: 1/8 inch in 20 feet (3.2 mm in 6 m); 1/4 inch in 40 feet (6.35 mm in 12.2 m).
3. Alignment:
 - a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch (12.7 mm) wide, limit offset from true alignment to 1/16 inch (1.6 mm).
 - b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch (12.7 to 25.4 mm) wide, limit offset from true alignment to 1/8 inch (3.2 mm).
 - c. Where surfaces are separated by reveal or protruding element of 1 inch (25.4 mm) wide or more, limit offset from true alignment to 1/4 inch (6 mm).

4. Location: Limit variation from plane to 1/8 inch in 12 feet (3.2 mm in 3.6 m); 1/2 inch (12.7 mm) over total length.

3.5 MAINTENANCE SERVICE

A. Entrance Door Hardware:

1. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of entrance door hardware.
2. Initial Maintenance Service: Beginning at Substantial Completion, provide six months' full maintenance by skilled employees of entrance door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper entrance door hardware operation at rated speed and capacity. Use parts and supplies that are the same as those used in the manufacture and installation of original equipment.

END OF SECTION

SECTION 084413 - GLAZED ALUMINUM CURTAIN WALLS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Glazed aluminum curtain wall systems and the following components of curtain wall assemblies:
 - 1. Entrance door adapters.
 - 2. Metal panels, fillers, trim and closures, for exterior and interior conditions.
- B. Related Requirements:
 - 1. Section 076200 "Sheet Metal Flashings and Trim" for flashings and trim associated with glazed curtain wall system not specifically listed.
 - 2. Section 078443 "Joint Firestopping" perimeter fire-containment systems (safing insulation) field installed with glazed aluminum curtain walls.
 - 3. Section 079200 "Joint Sealants" for installation of joint sealants installed with glazed aluminum curtain walls and for sealants to the extent not specified in this Section.
 - 4. Section 084113 "Aluminum-Framed Entrances and Storefronts" for entrance doors in curtain wall systems.
 - 5. Section 088853 "Security Glazing" for curtainwall glazing.

1.2 PREINSTALLATION MEETINGS

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

1.3 ACTION SUBMITTALS

- A. Sustainable Design Submittals: Provide Sustainable Design Submittals in Accordance with Section 018113.
 - 1. Building Product Disclosure Requirements: To encourage the use of building products that are working to minimize their environmental and health impacts, provide the following information when available:
 - a. Environmental Product Declaration: Submit with Product-specific Type III or Industry-wide Type III Environmental Product Declaration (EPD).
 - 2. Recycled Content: The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.
 - 3. Regional Materials: Materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles (160 km) of Project Site. If only a fraction of a product or material is extracted/harvested/recovered and manufactured locally, then only that percentage (by weight) shall contribute to the regional value.
- B. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- C. Shop Drawings: For glazed aluminum curtain walls. Include plans, elevations, sections, full-size details, and attachments to other work.

1. Include project-specific details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
 2. Include full-size isometric details of each vertical-to-horizontal intersection of glazed aluminum curtain walls, showing the following:
 - a. Joinery, including concealed welds.
 - b. Anchorage.
 - c. Expansion provisions.
 - d. Glazing.
 - e. Flashing and drainage.
 3. Show connection to, and continuity with, adjacent thermal, weather, air, and vapor barriers.
- D. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.
- E. Delegated-Design Submittal: For glazed aluminum curtain walls, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
1. Submit delegated-design submittal concurrently with shop drawings.
- 1.4 INFORMATIONAL SUBMITTALS
- A. Qualification Data:
1. For Installer and field-testing agency.
 2. For professional engineer's experience with providing delegated-design engineering services of the kind indicated, including documentation that engineer is licensed in the jurisdiction or state in which Project is located.
- B. Energy Performance Certificates: For glazed aluminum curtain walls, accessories, and components from manufacturer.
1. Basis for Certification: NFRC-certified energy performance values for each glazed aluminum curtain wall.
- C. Product Test Reports: For glazed aluminum curtain walls, for tests performed by a qualified testing agency, or by manufacturer and witnessed by a qualified testing agency.
- D. Quality-Control Program: Developed specifically for Project, including fabrication and installation, according to recommendations in ASTM C 1401. Include periodic quality-control reports.
- E. Source quality-control reports.
- F. Field quality-control reports.
- G. Sample Warranties: For special warranties.
- 1.5 CLOSEOUT SUBMITTALS
- A. Maintenance Data: For glazed aluminum curtain walls to include in maintenance manuals.
- B. Maintenance Data for Structural Sealant: For structural-sealant-glazed curtain walls to include in maintenance manuals. Include ASTM C 1401 recommendations for post-installation-phase quality-control program.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated and acceptable to Owner and Architect.
- C. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.
 - 1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.
- D. Structural-Sealant Glazing: Comply with ASTM C 1401 for design and installation of curtain wall assemblies.

1.7 WARRANTY

- A. Special Assembly Warranty: Manufacturer agrees to repair or replace components of glazed aluminum curtain wall that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including, but not limited to, excessive deflection.
 - b. Noise or vibration created by wind and thermal and structural movements.
 - c. Deterioration of metals and other materials beyond normal weathering.
 - d. Water penetration through fixed glazing and framing areas.
 - e. Failure of operating components.
 - 2. Warranty Period: 5 years from date of Substantial Completion.
- B. Special Finish Warranty, Anodized Finishes: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of anodized finishes within specified warranty period.
 - 1. Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Delta E units when tested in accordance with ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D 4214.
 - c. Cracking, peeling, or chipping.
 - 2. Warranty Period: 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design glazed aluminum curtain walls.

- B. General Performance: Comply with performance requirements specified, as determined by testing of glazed aluminum curtain walls representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
1. Glazed aluminum curtain walls shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
 2. Failure also includes the following:
 - a. Thermal stresses transferring to building structure.
 - b. Glass breakage.
 - c. Noise or vibration created by wind and thermal and structural movements.
 - d. Loosening or weakening of fasteners, attachments, and other components.
 - e. Failure of operating units.
- C. Structural Loads:
1. Wind Loads: As indicated on Drawings.
 2. Other Design Loads: As indicated on Drawings.
- D. Deflection of Framing Members: At design wind pressure, as follows:
1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane not exceeding 1/175 of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to 3/4 inch (19.1 mm), whichever is less.
 2. Deflection Parallel to Glazing Plane: Limited to amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components to less than 1/8 inch (3.2 mm).
 - a. Operable Units: Provide a minimum 1/16-inch (1.6-mm) clearance between framing members and operable units.
 3. Cantilever Deflection: Where framing members overhang an anchor point, as follows:
 - a. Perpendicular to Plane of Wall: No greater than 1/240 of clear span plus 1/4-inch (6.35-mm) for spans greater than 11 feet 8-1/4 inches (3.6 m) or 1/175 times span, for spans less than 11 feet 8-1/4 inches (3.6 m).
- E. Structural: Test according to ASTM E 330 as follows:
1. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
 2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
 3. Test Durations: As required by design wind velocity, but not less than 10 seconds.
- F. Water Penetration under Static Pressure: Test according to ASTM E 331 as follows:
1. No evidence of water penetration through fixed glazing and framing areas when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 20 lbf/sq. ft. (957 Pa).
- G. Water Penetration under Dynamic Pressure: Test according to AAMA 501.1 as follows:

1. No evidence of water penetration through fixed glazing and framing areas when tested at dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 15 lbf/sq. ft. (720 Pa).
 2. Maximum Water Leakage: No uncontrolled water penetrating assemblies or water appearing on assemblies' normally exposed interior surfaces from sources other than condensation. Water leakage does not include water controlled by flashing and gutters, or water that is drained to exterior.
- H. Interstory Drift: Accommodate design displacement of adjacent stories indicated.
1. Design Displacement: As indicated on Drawings.
 2. Test Performance: Complying with criteria for passing based on building occupancy type when tested according to AAMA 501.4 at design displacement and 1.5 times the design displacement.
- I. Seismic Performance: Glazed aluminum curtain walls shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
1. Seismic Drift Causing Glass Fallout: Complying with criteria for passing based on building occupancy type when tested according to AAMA 501.6 at design displacement and 1.5 times the design displacement.
 2. Vertical Interstory Movement: Complying with criteria for passing based on building occupancy type when tested according to AAMA 501.7 at design displacement and 1.5 times the design displacement.
- J. Energy Performance: Certified and labeled by manufacturer for energy performance as follows:
1. Thermal Transmittance (U-factor):
 - a. Fixed Glazing and Framing Areas: U-factor for the system of not more than 0.38 Btu/sq. ft. x h x deg F (2.16 W/sq. m x K) as determined in accordance with NFRC 100.
 2. Solar Heat Gain Coefficient (SHGC):
 - a. Fixed Glazing and Framing Areas: SHGC for the system of not more than 0.29 as determined in accordance with NFRC 200.
 3. Air Leakage:
 - a. Fixed Glazing and Framing Areas: Air leakage for the system of not more than 0.06 cfm/sq. ft. (0.30 L/s per sq. m) at a static-air-pressure differential of 6.24 lbf/sq. ft. (300 Pa) when tested in accordance with ASTM E283.
 - b. Venting Windows: Whole-window air leakage of not more than 0.3 cfm/sq. ft. (0.30 L/s per sq. m) at a static-air-pressure differential of 6.24 lbf/sq. ft. (300 Pa) when tested in accordance with AAMA/WDMA/CSA 101/I.S.2/A440.
- K. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes:
1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- L. Structural-Sealant Joints: Designed to carry gravity loads of glazing.
- M. Structural Sealant: ASTM C1184. Capable of withstanding tensile and shear stresses imposed by structural-sealant-glazed curtain walls without failing adhesively or cohesively. When tested for

preconstruction adhesion and compatibility, cohesive failure of sealant shall occur before adhesive failure.

1. Adhesive failure occurs when sealant pulls away from substrate cleanly, leaving no sealant material behind.
2. Cohesive failure occurs when sealant breaks or tears within itself but does not separate from each substrate because sealant-to-substrate bond strength exceeds sealant's internal strength.

2.2 SOURCE LIMITATIONS

- A. Source Limitations: Obtain all components of curtain wall system, including framing venting windows, entrances and accessories, from single manufacturer and from same manufacturer of aluminum-framed storefront systems.

2.3 GLAZED ALUMINUM CURTAIN WALL SYSTEMS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Kawneer 1600 Wall System 1 Curtain Wall System, or comparable product by one of the following:
 1. EFCO 5600 OG Curtain Wall
 2. YKK YCW 750 OGP
- B. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
 1. Construction: Thermally broken.
 2. Glazing System: Retained mechanically with gaskets on vertical and horizontal mullions
 3. Finish: Liquid Fluoropolymer Aluminum Extrusion Coatings, AAMA 2605-20: Minimum 70 percent PVDF resin by weight
 - a. Color: PPG UC106695F Sunstorm Café Noir Pearl
 4. Fabrication Method: Field-fabricated framing system.
 5. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 6. Steel Reinforcement: As required by manufacturer.
- C. Pressure Caps: Manufacturer's standard aluminum components that mechanically retain glazing.
 1. Include snap-on aluminum trim that conceals fasteners.
- D. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.
- E. Entrance Door Systems: Comply with Section 084113 "Aluminum-Framed Entrances and Storefronts."
- F. Entrance Frame Adapters: Manufacturer's standard system designed to integrate specified entrance doors into curtain wall system.
- G. Weather Stripping: Manufacturer's standard replaceable components.
 1. Compression Type: Made of ASTM D 2000, molded neoprene, or ASTM D 2287, molded PVC.
 2. Sliding Type: AAMA 701/702, made of wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.

- H. Weather Sweeps: Manufacturer's standard exterior-door bottom sweep with concealed fasteners on mounting strip.

2.4 GLAZING

- A. Glazing: Comply with Section 088000 "Glazing."
- B. Glazing Gaskets: ASTM C509 or ASTM C864. Manufacturer's standard unless otherwise indicated. For gaskets in continuous contact with structural silicone, use extruded silicone or compatible material.
 - 1. Color: Black.
- C. Glazing Sealants: As recommended by manufacturer.
- D. Structural Glazing Sealants: ASTM C 1184, chemically curing silicone formulation that is compatible with system components with which it comes in contact, specifically formulated and tested for use as structural sealant and approved by structural-sealant manufacturer for use in curtain-wall assembly indicated.
 - 1. Color: Black

2.5 MATERIALS

- A. Sheet and Plate: ASTM B209 (ASTM B209M).
- B. Extruded Bars, Rods, Profiles, and Tubes: ASTM B221 (ASTM B221M).
- C. Extruded Structural Pipe and Tubes: ASTM B429/B429M.
- D. Structural Profiles: ASTM B308/B308M.
- E. Steel Reinforcement:
 - 1. Structural Shapes, Plates, and Bars: ASTM A36/A36M.
 - 2. Cold-Rolled Sheet and Strip: ASTM A1008/A1008M.
 - 3. Hot-Rolled Sheet and Strip: ASTM A1011/A1011M.
- F. Steel Reinforcement Primer: 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 in accordance with recommendations in SSPC-SP COM, and prepare surfaces in accordance with applicable SSPC standard.

2.6 ACCESSORIES

- A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
 - 1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
 - 2. Reinforce members as required to receive fastener threads.
 - 3. Use exposed fasteners with countersunk Phillips screw heads, fabricated from 300 series stainless steel.

- B. 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.
- C. Concealed Flashing: Dead-soft, 0.018-inch- (0.457-mm-) thick stainless steel, ASTM A 240/A 240M of type recommended by manufacturer.
- D. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil (0.762-mm) thickness per coat.

2.7 AUXILIARY COMPONENTS

- A. Fillers, Trim and Closures: Provide filler panels, trim, cover plates, slab-edge covers, and other closures, for both exterior and interior conditions as shown, not less than 0.125-inch wall thickness, complete with anchors for support to structure. Allow for erection tolerances and provide for movement of curtain wall due to thermal expansion and building deflections, as indicated.
 - 1. Fabricate fillers, trim and closures from extruded aluminum unless otherwise indicated.
 - 2. Exposed Finish: Match curtain wall framing.

2.8 FABRICATION

- A. Form or extrude aluminum shapes before finishing.
- B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- C. Fabricate components that, when assembled, have the following characteristics:
 - 1. Profiles that are sharp, straight, and free of defects or deformations.
 - 2. Accurately fitted joints with ends coped or mitered.
 - 3. Physical and thermal isolation of glazing from framing members.
 - 4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
 - 5. Provisions for field replacement of glazing from exterior.
 - 6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
- D. Fabricate components to resist water penetration as follows:
 - 1. Pressure-equalized system or double barrier design with primary air and vapor barrier at interior side of glazed aluminum curtain wall and secondary seal weeped and vented to exterior.
 - a. Drill weep holes in the factory and finish edges to match finish on curtain wall framing. Do not field cut weeps or leave unfinished cut edges exposed.
- E. Curtain-Wall Framing: Fabricate components for assembly using manufacturer's standard assembly method.
- F. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.9 ALUMINUM FINISHES

- A. Finish: Liquid Fluoropolymer Aluminum Extrusion Coatings, AAMA 2605-20: Minimum 70 percent PVDF resin by weight
 - a. Color: PPG UC106695F Sunstorm Café Noir Pearl

2.10 SOURCE QUALITY CONTROL

- A. Structural Sealant: Perform quality-control procedures complying with ASTM C 1401 recommendations including, but not limited to, assembly material qualification procedures, sealant testing, and assembly fabrication reviews and checks.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION, GENERAL

- A. Comply with manufacturer's written instructions.
- B. Do not install damaged components.
- C. Fit joints to produce hairline joints free of burrs and distortion.
- D. Rigidly secure nonmovement joints.
- E. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
- F. Where welding is required, weld components in concealed locations to minimize distortion or discoloration of finish. Protect glazing surfaces from welding.
- G. Seal joints watertight unless otherwise indicated.
- H. Metal Protection:
 - 1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with primer, applying sealant or tape, or installing nonconductive spacers as recommended by manufacturer for this purpose.
 - 2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- I. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within glazed aluminum curtain wall to exterior.
- J. Install components plumb and true in alignment with established lines and grades.

3.3 INSTALLATION OF GLAZING

- A. Install glazing as specified in Section 088000 "Glazing."

3.4 INSTALLATION OF STRUCTURAL GLAZING

- A. Prepare surfaces that will contact structural sealant in accordance with sealant manufacturer's written instructions, to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.
- B. Set glazing into framing in accordance with sealant manufacturer's and framing manufacturer's written instructions and standard practice. Use a spacer or backer as recommended by manufacturer.
- C. Set glazing with acid-etched pattern in consistent orientation to align pattern between adjacent units.
- D. Set glazing with proper orientation, so that coatings face exterior or interior as specified.
- E. Hold glazing in place using temporary retainers of type and spacing recommended by manufacturer, until structural sealant joint has cured.
- F. Apply structural sealant to completely fill cavity, in accordance with sealant manufacturer's and framing manufacturer's written instructions and in compliance with local codes.
- G. Apply structural sealant at temperatures indicated by sealant manufacturer for type of sealant.
- H. Allow structural sealant to cure in accordance with manufacturer's recommendations.
- I. Clean and protect glass as indicated in Section 088000 "Glazing."

3.5 ERECTION TOLERANCES

- A. Install glazed aluminum curtain walls to comply with the following maximum tolerances:
 - 1. Plumb: 1/8 inch in 10 feet (3.2 mm in 3 m); 1/4 inch in 40 feet (6.35 mm in 12.2 m).
 - 2. Level: 1/8 inch in 20 feet (3.2 mm in 6 m); 1/4 inch in 40 feet (6.35 mm in 12.2 m).
 - 3. Alignment:
 - a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch (12.7 mm) wide, limit offset from true alignment to 1/16 inch (1.6 mm).
 - b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch (12.7 to 25.4 mm) wide, limit offset from true alignment to 1/8 inch (3.2 mm).
 - c. Where surfaces are separated by reveal or protruding element of 1 inch (25.4 mm) wide or more, limit offset from true alignment to 1/4 inch (6 mm).
 - 4. Location: Limit variation from plane to 1/8 inch in 12 feet (3.2 mm in 3.6 m); 1/2 inch (12.7 mm) over total length.

3.6 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Structural-Sealant Adhesion: Test structural sealant according to recommendations in ASTM C 1401, Destructive Test Method A, "Hand Pull Tab (Destructive)," Appendix X2.
 - 1. Test a minimum of four areas on each building facade.

- 2. Repair installation areas damaged by testing.
- C. Glazed aluminum curtain walls will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

END OF SECTION

SECTION 084523 - INSULATED TRANSLUCENT FIBERGLASS SANDWICH PANEL WALL SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes the insulated translucent sandwich panel system and accessories as shown and specified. Work includes providing and installing:
 - 1. 2-3/4" factory prefabricated structural insulated translucent sandwich panels
 - 2. Aluminum installation system
 - 3. Integrated Fixed Window Units
- B. Related Requirements:
 - 1. Section 076200 "Sheet Metal Flashings and Trim" for flashings and trim associated with translucent wall panel system
 - 2. Section 079200 "Joint Sealants" for installation of joint sealants installed with translucent panel wall system and for sealants to the extent not specified in this Section.
 - 3. Section 088853 "Security Glazing" for glazing within translucent wall system framing.
- C.

1.2 ACTION SUBMITTALS

- B. Sustainable Design Submittals: Provide Sustainable Design Submittals in Accordance with Section 018113.
 - 1. Building Product Disclosure Requirements: To encourage the use of building products that are working to minimize their environmental and health impacts, provide the following information when available:
 - a. Environmental Product Declaration: Submit with Product-specific Type III or Industry-wide Type III Environmental Product Declaration (EPD).
 - 2. Recycled Content: The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.
 - 3. Regional Materials: Materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles (160 km) of Project Site. If only a fraction of a product or material is extracted/harvested/recovered and manufactured locally, then only that percentage (by weight) shall contribute to the regional value.
- B. Submit manufacturer's product data. Include construction details, material descriptions, profiles and finishes of components.
- C. Submit shop drawings. Include elevations and details.
- D. Submit manufacturer's color charts showing the full range of colors available for factory-finished aluminum.
 - 1. When requested, submit samples for each exposed finish required, in same thickness and material indicated for the work and in size indicated below. If finishes involve normal color variations, include sample sets consisting of two or more units showing the full range of variations expected.
 - a. Sandwich panels: 14" x 28" units

- b. Factory finished aluminum: 5" long sections
- E. Submit Installer Certificate, signed by installer, certifying compliance with project qualification requirements.
- F. Submit product reports from a qualified independent testing agency indicating each type and class of panel system complies with the project performance requirements, based on comprehensive testing of current products.

1.3 QUALITY ASSURANCE

A. Manufacturer's Qualifications

1. Material and products shall be manufactured by a company continuously and regularly employed in the manufacture of specified materials for a period of at least ten consecutive years and which can show evidence of those materials being satisfactorily used on at least six projects of similar size, scope and location. At least three of the projects shall have been in successful use for ten years or longer.
2. Panel system must be listed by an ANSI accredited Evaluation Service, which requires quality control inspections and fire, structural and water infiltration testing of sandwich panel systems by an accredited agency.
3. Quality control inspections shall be conducted at least once each year and shall include manufacturing facilities, sandwich panel components and production sandwich panels for conformance with AC177 "Translucent Fiberglass Reinforced Plastic (FRP) Faced Panel Wall, Roof and Skylight Systems" as issued by the ICC-ES.

- B. Installer's Qualifications: Installation shall be by an experienced installer, which has been in the business of installing specified panel systems for at least two consecutive years and can show evidence of satisfactory completion of projects of similar size, scope and type.

1.4 PERFORMANCE REQUIREMENTS

A. The manufacturer shall be responsible for the configuration and fabrication of the complete panel system.

1. When requested, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
2. Standard panel system shall have less than 0.01 cfm/ft² air leakage by ASTM E 283 at 6.24 PSF (50 mph) and no water penetration by ASTM E 331 at 15 PSF; and structural testing by ASTM E 330.
3. Structural Loads; Provide system capable of handling the following loads:
 - a. Positive Wind Load: See S-Series Drawings
 - b. Negative Wind Load: See S-Series Drawings

1.5 DELIVERY STORAGE AND HANDLING

- A. Deliver panel system, components and materials in manufacturer's standard protective packaging.
- B. Store panels on the long edge; several inches above the ground, blocked and under cover in accordance with manufacturer's storage and handling instructions.

1.6 WARRANTY

- A. Submit manufacturer's and installer's written warranty agreeing to repair or replace panel system work, which fails in materials or workmanship within one year of the date of delivery. Failure of materials or workmanship shall

include leakage, excessive deflection, deterioration of finish on metal in excess of normal weathering, defects in accessories, insulated translucent sandwich panels and other components of the work.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. The basis for this specification is for products manufactured by Kalwall Corporation. Other manufacturers may bid this project provided they comply with all of the performance requirements of this specification and submit evidence thereof. Listing other manufacturers' names in this specification does not constitute approval of their products or relieve them of compliance with all the performance requirements contained herein.

2.2 PANEL COMPONENTS

A. Face Sheets

1. Translucent faces: Manufactured from glass fiber reinforced thermoset resins, formulated specifically for architectural use.
 - a. Thermoplastic (e.g. polycarbonate, acrylic) faces are not acceptable.
 - b. Face sheets shall not deform, deflect or drip when subjected to fire or flame.
2. Interior face sheets:
 - a. Flame spread: Underwriters Laboratories (UL) listed, which requires periodic unannounced retesting, with flame spread rating no greater than 70 and smoke developed no greater than 250 when tested in accordance with UL 723.
 - b. Burn extent by ASTM D 635 shall be no greater than 1".
3. Exterior face sheets:
 - a. Color stability: Full thickness of the exterior face sheet shall not change color more than 3 CIE Units DELTA E by ASTM D 2244 after 5 years outdoor South Florida weathering at 5° facing south, determined by the average of at least three white samples with and without a protective film or coating to ensure long-term color stability. Color stability shall be unaffected by abrasion or scratching.
 - b. Strength: Exterior face sheet shall be uniform in strength, impenetrable by hand-held pencil and repel an impact minimum of .070 ft. lbs. without fracture or tear when impacted by a 3-1/4" diameter, 5 lb. free-falling ball per UL 972.
4. Appearance:
 - a. Exterior face sheets: Smooth .070" thick and crystal in color.
 - b. Interior face sheets: Smooth .045" thick and white in color.
 - c. Face sheets shall not vary more than ± 10% in thickness and be uniform in color.

B. Grid Core

1. Thermally broken I-beam grid core shall be of 6063-T6 or 6005-T5 alloy and temper with provisions for mechanical interlocking of muntin-mullion and perimeter. Width of I-beam shall be no less than 7/16".
2. I-beam Thermal break: Minimum 1", thermoset fiberglass composite.

C. Laminate Adhesive

1. Heat and pressure resin type adhesive engineered for structural sandwich panel use, with minimum 25-years field use. Adhesive shall pass testing requirements specified by the International Code Council "Acceptance Criteria for Sandwich Panel Adhesives".
2. Minimum tensile strength of 750 PSI when the panel assembly is tested by ASTM C 297 after two exposures to six cycles each of the aging conditions prescribed by ASTM D 1037.
3. Minimum shear strength of the panel adhesive by ASTM D 1002 after exposure to four separate conditions:
 - a. 50% Relative Humidity at 68° F: 540 PSI
 - b. 182° F: 100 PSI
 - c. Accelerated Aging by ASTM D 1037 at room temperature: 800 PSI
 - d. Accelerated Aging by ASTM D 1037 at 182° F: 250 PSI

2.3 PANEL CONSTRUCTION

- A. Provide sandwich panels of flat fiberglass reinforced translucent face sheets laminated to a grid core of mechanically interlocking I-beams. The adhesive bonding line shall be straight, cover the entire width of the I-beam and have a neat, sharp edge.
 1. Thickness: 2-3/4"
 2. Light transmission: 26%.
 3. Solar heat gain coefficient .30
 4. Panel U-factor by NFRC certified laboratory: 2-3/4" thermally broken grid 0.14
 5. Grid pattern: 8" x 20"; pattern shoji.
- B. Standard panels shall deflect no more than 1.9" at 30 PSF in 10' 0" span without a supporting frame by ASTM E 72.
- C. Standard panels shall withstand 1200° F fire for minimum one hour without collapse or exterior flaming.
- D. Thermally broken panels: Minimum Condensation Resistance Factor of 80 by AAMA 1503 measured on the bond line.

2.4 BATTENS AND PERIMETER CLOSURE SYSTEM

- A. Closure system: Thermally broken extruded aluminum 6063-T6 and 6063-T5 alloy and temper clamp-tite screw type closure system.
- B. Sealing tape: Manufacturer's standard, pre-applied to closure system at the factory under controlled conditions.
- C. Fasteners: 300 series stainless steel screws for aluminum closures, excluding final fasteners to the building.
- D. Finish:
 1. Manufacturer's factory applied finish, which meets the performance requirements of AAMA 2604
 2. Color: Aluminum #79

2.5 WINDOWS

- A. Windows shall be designed specifically for inclusion in the translucent panel unit wall system and factory unitized to panels.

1. Units shall be of the following type(s): Fixed lite
- C. Performance: Windows shall pass or exceed requirements of AAMA/WDMA/CSA-101/I.S.2/A440-05 (08).
1. HC-2000 Fixed widows: F-AW80; shall pass requirements at 120 psf uniform structural load with air infiltration $<.01$ CFM/FT² at 6.24 PSF and no water penetration at 12 PSF.
- D. Construction: All window frame members shall be of extruded 6063-T5 aluminum with a thermal break. Frame sections shall be coped and joined by stainless steel screws at each corner. All joints exposed to the weather shall be sealed with an elastic compound. All openings shall be double weather stripped using T-slot bulb gaskets to insure minimum air infiltration.
1. Fixed lites shall be inside glazed with an expanded EPDM closed cell sponge gasket to exterior, with aluminum glazing bead and a driven EPDM wedge gasket to the interior for rapid removal and replacement.
- E. Glazing:
1. Heavy commercial (HC2000) windows shall be glazed with 1" insulated glass.units
 2. Glazing Specification: Refer to Section 088000
- F. Finish is to be coordinated with closure system.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Installer shall examine substrates, supporting structure and installation conditions.
- B. Do not proceed with panel installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Metal Protection:
1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose.
 2. Where aluminum will contact concrete, masonry or pressure treated wood, protect against corrosion by painting contact surfaces with bituminous paint or method recommended by manufacturer.

3.3 INSTALLATION

- A. Install the panel system in accordance with the manufacturer's suggested installation recommendations and approved shop drawings.
1. Anchor component parts securely in place by permanent mechanical attachment system.
 2. Accommodate thermal and mechanical movements.
 3. Set perimeter framing in a full bed of sealant compound, or with joint fillers or gaskets to provide weather-tight construction.

- B. Install joint sealants at perimeter joints and within the panel system in accordance with manufacturer's installation instructions.

3.4 CLEANING

- A. Clean the panel system interior and exterior, immediately after installation.
- B. Refer to manufacturer's written recommendations.

END OF SECTION

SECTION 085113 - ALUMINUM WINDOWS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Aluminum fixed and in-swinging hopper windows for exterior replacement locations.
- B. Related Requirements:
 - 1. Section 076200 "Sheet Metal Flashing and Trim"
 - 2. Section 088000 "Glazing" for glazing requirements for aluminum windows, including those specified to be factory- or site-glazed units.
 - 3. Section 088853 "Security Glazing" for glazing requirements for aluminum windows, including those specified to be factory- or site-glazed units.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 2. Review and discuss the finishing of aluminum windows that is required to be coordinated with the finishing of other aluminum work for color and finish matching.
 - 3. Review, discuss, and coordinate the interrelationship of aluminum windows with other exterior wall components. Include provisions for anchoring, flashing, weeping, sealing perimeters, and protecting finishes.
 - 4. Review and discuss the sequence of work required to construct a watertight and weathertight exterior building envelope.
 - 5. Inspect and discuss the condition of substrate and other preparatory work performed by other trades.

1.3 ACTION SUBMITTALS

- A. Sustainable Design Submittals: Provide Sustainable Design Submittals in Accordance with Section 018113.
 - 1. Building Product Disclosure Requirements: To encourage the use of building products that are working to minimize their environmental and health impacts, provide the following information when available:
 - a. Environmental Product Declaration: Submit with Product-specific Type III or Industry-wide Type III Environmental Product Declaration (EPD).
 - 2. Recycled Content: The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.
 - 3. Regional Materials: Materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles (160 km) of Project Site. If only a fraction of a product or material is extracted/harvested/recovered and manufactured locally, then only that percentage (by weight) shall contribute to the regional value.
- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, glazing and fabrication methods, dimensions of individual components and profiles, hardware, and finishes for aluminum windows.

- B. Shop Drawings: For aluminum windows.
 - 1. Include plans, elevations, sections, hardware, accessories, insect screens, operational clearances, and details of installation, including anchor, flashing, and sealant installation.
- C. Samples for Initial Selection: For units with factory-applied finishes.
 - 1. Include Samples of hardware and accessories involving color selection.
- D. Samples for Verification: For aluminum windows and components required, showing full range of color variations for finishes, and prepared on Samples of size indicated below:
 - 1. Exposed Finishes: 2 by 4 inches (50 by 100 mm).
 - 2. Exposed Hardware: Full-size units.
- E. Product Schedule: For aluminum windows. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer and Installer.
- B. Product Test Reports: For each type of aluminum window, for tests performed by a qualified testing agency.
- C. Sample Warranties: For manufacturer's warranties.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A manufacturer capable of fabricating aluminum windows that meet or exceed performance requirements indicated and of documenting this performance by test reports and calculations.
- B. Installer Qualifications: An installer acceptable to aluminum window manufacturer for installation of units required for this Project.

1.6 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace aluminum windows that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Failure to meet performance requirements.
 - b. Structural failures including excessive deflection, water leakage, condensation, and air infiltration.
 - c. Faulty operation of movable sash and hardware.
 - d. Deterioration of materials and finishes beyond normal weathering.
 - e. Failure of insulating glass.
 - 2. Warranty Period:
 - a. Window: 10 years from date of Substantial Completion.
 - b. Glazing Units: 10 years from date of Substantial Completion.

- c. Aluminum Finish: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain aluminum windows from single source from single manufacturer.

2.2 WINDOW PERFORMANCE REQUIREMENTS

- A. Product Standard: Comply with AAMA/WDMA/CSA 101/I.S.2/A440 for definitions and minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.
 - 1. Window Certification: AAMA certified with label attached to each window.
- B. Performance Class and Grade: AAMA/WDMA/CSA 101/I.S.2/A440 as follows:
 - 1. Minimum Performance Class: AW-65 (Operable); AW-100 (Fixed)
- C. Air Infiltration: Test according to ASTM E 283 for infiltration as follows:
 - 1. Fixed and Casement Windows: Maximum air leakage of 0.01 cfm/sq. ft. (0.05 L/s per sq. m) at a static-air- pressure differential of 6.2 lbf/sq. ft. (300 Pa).
- D. Water Penetration under Static Pressure: Test according to ASTM E 331 as follows:
 - 1. No evidence of water penetration through glazing and framing areas when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 10 lbf/sq. ft. for single-hung windows and 12 lbf/sq. ft. for casements.
- E. Condensation-Resistance Factor (CRF): Provide aluminum windows tested for thermal performance according to AAMA 1503, showing a CRF of 71 for frame and 67 for glass.
- F. Thermal Transmittance (U-Factor) for the overall window area shall be less than or equal to 0.38 BTU/hr-ft²-°F.
- G. Solar Heat Gain Coefficient (SHGC) for the overall window area shall not exceed 0.28.
- H. Thermal Movements: Provide aluminum windows, including anchorage, that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change: 120 deg F (67 deg C) ambient; 180 deg F (100 deg C) material surfaces.

2.3 ALUMINUM WINDOWS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide the following models by Wausau Window and Wall Systems, or approved equal
 - 1. Fixed and operable windows: Wausau Window and Wall Systems INvent 4250i-XL Simulated Double Hung and INvent Series Fixed windows with extended thermal separation

- B. Operating Type: Project In, at locations indicated on Drawings.
 - C. Frames and Sashes: Aluminum extrusions complying with AAMA/WDMA/CSA 101/I.S.2/A440.
 - 1. Thermally Improved Construction: Fabricate frames, sashes, and muntins with an integral, concealed, low-conductance thermal barrier located between exterior materials and window members exposed on interior side in a manner that eliminates direct metal-to-metal contact.
 - D. Insulating-Glass Units: As specified in Section 088000 "Glazing" and 088883 "Security Glazing"
 - E. Hardware, General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, carbon steel complying with AAMA 907, or other corrosion-resistant material compatible with adjacent materials; designed to smoothly operate, tightly close, and securely lock windows, and sized to accommodate sash weight and dimensions.
 - 1. Exposed Hardware Color and Finish: As selected by Architect from manufacturer's full range.
 - F. Weather Stripping: Provide full-perimeter weather stripping for each operable sash unless otherwise indicated.
 - G. Fasteners: Noncorrosive and compatible with window members, trim, hardware, anchors, and other components.
 - 1. Exposed Fasteners: Do not use exposed fasteners to greatest extent possible. For application of hardware, use fasteners that match finish hardware being fastened.
- 2.4 ACCESSORIES
- A. Interior Trim: Extruded-aluminum profiles in sizes and configurations indicated on Drawings.
 - B. Panning Trim: Extruded-aluminum profiles in sizes and configurations indicated on Drawings.
 - C. Muntins: Provide simulated muntin grids as shown on architectural drawings.
 - D. Receptors: Provide extruded aluminum receptors to receive windows, as shown on architectural drawings.
 - E. Insect Screens: Tubular extruded aluminum frames with aluminum cloth with 18x16 mesh.
- 2.5 FABRICATION
- A. Fabricate aluminum windows in sizes indicated. Include a complete system for assembling components and anchoring windows.
 - B. Glaze aluminum windows in the factory.
 - C. Weather strip each operable sash to provide weathertight installation.
 - D. Weep Holes: Provide weep holes and internal passages to conduct infiltrating water to exterior.
 - E. Mullions: Provide mullions and cover plates, matching window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections. Provide mullions and cover plates capable of withstanding design wind loads of window units.

- F. Complete fabrication, assembly, finishing, hardware application, and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation.

2.6 GENERAL FINISH REQUIREMENTS

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

2.7 ALUMINUM FINISHES

- A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- B. Baked-On Powder-Coat Finish: AAMA 2604 except with a minimum dry film thickness of 1.5 mils (0.04 mm). Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
 - 1. Color and Gloss: PPG UC106695F Sunstorm Café Noir Pearl

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Verify rough opening dimensions, levelness of sill plate, and operational clearances.
- C. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure weathertight window installation.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components. For installation procedures and requirements not addressed in manufacturer's written instructions, comply with installation requirements in ASTM E 2112.
- B. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction to produce weathertight construction.
- C. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.

- D. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

3.3 ADJUSTING, CLEANING, AND PROTECTION

- A. Adjust operating sashes and hardware for a tight fit at contact points and weather stripping for smooth operation and weathertight closure.
- B. Clean exposed surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.
 - 1. Keep protective films and coverings in place until final cleaning.
- C. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.
- D. Protect window surfaces from contact with contaminating substances resulting from construction operations. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written instructions.

END OF SECTION

SECTION 085658 - WINDOW PROTECTION SCREENS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Metal framed protection screens mounted on exterior of window openings indicated; composed of stainless-steel tube frames with stainless-steel flexible-mesh infill.
 - 1. Work of this Section includes engineering design and detailing to size screen assemblies to withstand anticipated loads and accommodate any custom attachment details required to conform screens to existing openings

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for window protection screens.
- B. Shop Drawings:
 - 1. Include plans, elevations, sections, and details of attachment to surround materials.
 - 2. Elevations of units at 1/4-inch scale.
 - 3. Full-size section details of typical frame members.
 - 4. Installation details, including relationship to other work.
- C. Samples: For each exposed product, in manufacturer's standard size.

1.3 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For window protection screens to include in maintenance manuals.

1.4 FIELD CONDITIONS

- A. Field Measurements: Check actual window openings by accurate field measurement before fabrication. Show recorded measurements on shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the work.

1.5 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of window protection screens that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 12 months from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Window protection screen assemblies, including attachment to building construction, shall withstand the effects of anticipated loads and stresses within limits and under conditions indicated, including the following:
 - 1. Provide screen frame members and attachments of sufficient sizes and types to support screen mesh and anchor to supporting construction for screen sizes indicated.
 - 2. Component sizes indicated for window protection screens are the minimum and shall be adjusted to comply with performance requirements.

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

2.3 WINDOW PROTECTION SCREENS

- A. Window Protection Screens: Provide standard manufactured fixed protection screen units, sized to fit openings indicated and complying with the following:

2.4 WINDOW PROTECTION SCREENS

- A. Window Protection Screens: Provide manufactured fixed or operable protection screen units, sized to fit openings indicated and complying with requirements specified.
- B. Flexible Mesh Systems: Fabricated from wire rope made from wire complying with ASTM A 492, Type 316; joined with AISI Type 316L stainless-steel seamless ferrules; and factory-installed on stainless-steel frames.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Kane Innovations Level 5 Operable Steel NarrowLine Security Screen
 - a. Model S-NR5-O
 - b. Finish: Black
 - 2. Main Frame
 - a. The main frame rails shall be of not less than 16-gauge 1" [25.4mm] x 1" [25.4] seamless welded galvanized steel tubing with high strength die cast metal corners which are pneumatically inserted into the frame ends with an interference fit.
 - b. A removable face plate, extruded from 6063-T6 aluminum alloy, .062-inch thick .212 lbs./ft., shall be attached to the sides of the main frame using square drive Tek screws. The faceplate corner bead shall integrate with the sub-frame to conceal the hardware and fasteners.
 - 3. Sub-frame
 - a. The sub-frame shall be of channel design, extruded from 6063-T6-aluminum alloy. Weight shall be .515 lbs./ft. Wall thickness shall be .090 inch. The corners of the

subframe shall be mitered, secured by an internal tension coupling assembly and shall be resistant to both torsion and flexural failure.

- b. The sub-frame shall have a continuous groove retaining a combination cushioning strip/insect shield. The depth of the subframe shall be no more than 1 3/4".

4. Infill

- a. Mesh Cable Diameter: 1.5 mm.
- b. Mesh Aperture Dimensions: 60 mm.
- c. Perimeter Fittings: Mesh manufacturer's closed loops with lose ferrule for sewn-on installation method for attachment of mesh to perimeter frame.
- d. Mesh Orientation: Horizontal direction (grain).

5. Hardware

- a. Each screen shall be provided with two or more concealed 13-gauge, electroplated steel hinges with 1/4" [6.35] diameter hardened, loose stainless steel pins and integral compression guards. 13-gauge stainless steel hinge available.
 - b. Each screen shall include adjustment screws (1/4-20 x 3/4 Philips pan head thread cutting fastener) and .062-inch thick aluminum scribes. The 1-3/16" [30.1625] x 3/4" [19.05] scribes shall be supplied at the head and jambs if required.
 - c. Each screen shall come fully assembled and tested from the factory.
6. Accessories: Provide grommets, bushings, washers, swaging ferrules, studs, receivers, fittings, and other components as necessary for system installation. Provide anchorage devices and fittings as recommended by manufacturer to secure mesh assemblies to construction as indicated.
7. Anchors, Clips, and Accessories: Nonmagnetic stainless steel. Provide all necessary installation hardware, including screws and lead anchors suitable for anchoring to substrates indicated.

2.5 FABRICATION

- A. Shop Assembly: Fabricate, assemble and test window protection screen units in the factory. Coordinate with windows to provide size and frame configuration required for close-fitting assemblies.

2.6 FINISHES

- A. General: Finish products after assembly.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean surfaces of windows including frames and glass prior to installation of protection screens. Use appropriate cleaning agents that will not damage existing finishes or materials.

3.2 INSTALLATION

- A. Install materials and systems in accordance with manufacturer's instructions and approved submittals. Install materials and systems in proper relation with adjacent construction and with uniform appearance. Coordinate with work of other Sections.
- B. Set window protection screen units plumb, level, and true to line, without warp or rack of frames. Provide proper support and anchor securely in place.
- C. Restore damaged finishes. Clean and protect work from damage.

END OF SECTION

SECTION 087111 - DOOR HARDWARE

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:

1. Mechanical door hardware for the following:
 - a. Swinging doors.
 - b. Other doors to the extent indicated.
2. Cylinders for door hardware specified in other Sections.
3. Electrified door hardware.

B. Related Requirements:

1. Section 081113 "Hollow Metal Doors and Frames".
2. Section 081119 "Stainless-Steel Doors and Frames".
3. Section 084113 "Aluminum-Framed Entrances and Storefronts" for entrance door hardware, except cylinders.

C. Products furnished, but not installed, under this Section include the following. Coordinating, purchasing, delivering, and scheduling remain requirements of this Section.

1. Permanent cylinders cores and keys to be furnished and installed by *Philadelphia Parks and Recreation Department*.

1.2 COORDINATION

- A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.
- B. Door Hardware and Electrical Connections: Coordinate the layout and installation of scheduled electrified door hardware and related access control equipment with required connections to source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems.
- C. Door and Frame Preparation: Related Division 08 Sections (Steel, Aluminum and Wood) doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.
- D. Provide removal schedule of the lock cylinders and cores. Coordinate delivery of the salvaged items with the project coordinator. All items not delivered shall be replaced with new.
- E. Existing Openings: Where hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide proper door operation.

1.3 PRE-SUBMITTAL CONFERENCE:

- A. Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.
 - 1. Prior to installation of door hardware, arrange for manufacturers' representatives to hold a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for all doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
 - 2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
 - 3. Review sequence of operation narratives for each unique access controlled opening.
 - 4. Review and finalize construction schedule and verify availability of materials.
 - 5. Review the required inspecting, testing, commissioning, and demonstration procedures.

1.4 ACTION SUBMITTALS

- A. Sustainable Design Submittals: Provide Sustainable Design Submittals in Accordance with Section 018113.
 - 1. Building Product Disclosure Requirements: To encourage the use of building products that are working to minimize their environmental and health impacts, provide the following information when available:
 - a. Environmental Product Declaration: Submit with Product-specific Type III or Industry-wide Type III Environmental Product Declaration (EPD).
 - 2. Recycled Content: The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.
 - 3. Regional Materials: Materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles (160 km) of Project Site. If only a fraction of a product or material is extracted/harvested/recovered and manufactured locally, then only that percentage (by weight) shall contribute to the regional value.
- B. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- C. Shop Drawings: For electrified door hardware.
 - 1. Include diagrams for power, signal, and control wiring.
 - 2. Include details of interface of electrified door hardware and building safety and security systems.
- D. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 - 1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
 - 2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening.
 - a. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.

3. Content: Include the following information:
 - a. Type, style, function, size, label, hand, and finish of each door hardware item.
 - b. Manufacturer of each item.
 - c. Fastenings and other pertinent information.
 - d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
 - e. Explanation of abbreviations, symbols, and codes contained in schedule.
 - f. Mounting locations for door hardware.
 - g. Door and frame sizes and materials.
 4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.
- E. System Operational Descriptions: Complete system operational narratives for the access controlled openings defining the *Philadelphia Parks and Recreation Department's* prescribed requirements for the opening functionality. Narratives include, but are not limited to, the following situations: normal secured/unsecured state of door; authorized access; authorized egress; unauthorized access; unauthorized egress; fire alarm and loss of power conditions, and interfaces with other building controls systems.
 - F. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Submittals. The manual to include the name, address, and contact information of the manufacturers providing the hardware and their nearest service representatives. The final copies delivered after completion of the installation test to include "as built" modifications made during installation, checkout, and acceptance.
 - G. Warranties and Maintenance: Special warranties and maintenance agreements specified in this Section.
 - H. Keying Schedule: Prepared by or under the supervision of Installer's Architectural Hardware Consultant, detailing *Philadelphia Parks and Recreation Department's* final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations that are coordinated with the Contract Documents.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and Architectural Hardware Consultant.
- B. Product Certificates: For each type of electrified door hardware.
 1. Certify that door hardware for use on each type and size of labeled fire-rated doors complies with listed fire-rated door assemblies.
- C. Product Test Reports: For compliance with accessibility requirements, for tests performed by manufacturer and witnessed by a qualified testing agency, for door hardware on doors located in accessible routes.
- D. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of door hardware to include in maintenance manuals.
- B. Schedules: Final [door hardware] [and] [keying] schedule.

1.7 QUALITY ASSURANCE

- A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum [5] years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.
- B. Installer Qualifications: Installers, trained by the primary product manufacturers, with a minimum [3] years documented experience installing both standard and electrified builders hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- C. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum [5] years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor in good standing by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and the *Philadelphia Parks and Recreation Department* concerning both standard and electromechanical door hardware and keying.
 - 1. Scheduling Responsibility: Preparation of door hardware schedules.

1.8 OPERATION AND MAINTENANCE DATA

- A. Submit operation and maintenance data under provisions of Division 1 - Closeout Procedures.
- B. Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.

1.9 QUALIFICATIONS

- A. Manufacturers: Companies specializing in the manufacture of products specified in this Section with minimum five years experience.
- B. Hardware Supplier: Company specializing in supplying commercial door hardware with minimum five years experience.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.
- B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

1.11 WARRANTY

- A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive PPR of other rights PPR may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period

after final acceptance by the *Philadelphia Parks and Recreation Department*. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.
2. Faulty operation of the hardware.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
4. Electrical component defects and failures within the systems operation.

C. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.

D. Special Warranty Periods (Door Hardware):

1. Ten years for mortise locks and latches.
2. Five years for exit hardware.
3. Ten years for manual door closers.

1.12 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for *Philadelphia Parks and Recreation Department*'s continued adjustment, maintenance, and removal and replacement of door hardware.

1.13 SEQUENCING AND SCHEDULING

A. Coordinate work of this Section with other directly affected Sections involving manufacturer of any internal reinforcement for door hardware.

B. Furnish hardware templates to frame and door manufacturers for installation of hardware.

C. Provide removal's schedule of the lock's cylinder and cores. Coordinate delivery of the salvaged items with the department's Architect/Engineer. All items not delivered shall be replaced with new.

SPECIAL NOTE: All removal of the existing lock's cylinder and cores must be carefully done and set aside for the Department's disposition.

D. Package lock's cylinder and cores individually label and identify package with door opening code to match Hardware Schedule.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Item and manufacturer

Item	Manufacturer
Hinges	Markar & Stanley (Best)
Locksets, Cylinders and Cores	Best
Pull/Pull Plates	Rockwood
Kick Plates	Rockwood
Armor Plates	Rockwood
Closers	LCN
Thresholds	Reese & Pemko
Door Stops/Wall Bumpers	IVES & Rockwood
Exit Devices	Best (Precision)
Weatherstripping	Reese & Pemko

Keying Control System	Best
Remote Annunciator Panel	Detex
Magnetic Switch	GRI
Security Astragal, "TEE" Type	Markar
Surface Bolts	IVES
Padlocks	Master
Overhead Holder	LCN
Lock Guards	Markar
Removable Mullion (interior only)	Best (Precision)

B. Substitutions under the provisions of Section 012513.

2.2 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with NFPA 70, NFPA 80, NFPA 101 and ANSI A117.1 requirements and guidelines as directed in the model building code including, but not limited to, the following:

1. NFPA 70 "National Electrical Code", including electrical components, devices, and accessories listed and labeled as defined in Article 100 by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
2. Where indicated to comply with accessibility requirements, comply with Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG)," ANSI A117.1 as follows:
 - a. Handles, Pulls, Latches, Locks, and other Operating Devices: Shape that is easy to grasp with one hand and does not require tight grasping, tight pinching, or twisting of the wrist.
 - b. Door Closers: Comply with the following maximum opening-force requirements indicated:
 - 1) Interior Hinged Doors: 5 lbf applied perpendicular to door.
 - 2) Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
 - c. Thresholds: Not more than 1/2 inch high. Bevel raised thresholds with a slope of not more than 1:2.
3. NFPA 101: Comply with the following for means of egress doors:
 - a. Latches, Locks, and Exit Devices: Not more than 15 lbf to release the latch. Locks shall not require the use of a key, tool, or special knowledge for operation.
 - b. Thresholds: Not more than 1/2 inch high.
4. Fire-Rated Door Assemblies: Provide door hardware for assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252 (neutral pressure at 40" above sill) or UL-10C.
 - a. Test Pressure: Positive pressure labeling.
5. Retain "Smoke- and Draft-Control Door Assemblies" Paragraph below if required. The International Building Code requires fire door assemblies to comply with smoke- and draft-control requirements in corridors, smoke barriers, and smoke partitions.

- B. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that complies with requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
 - 1. Air Leakage Rate: Maximum air leakage of 0.3 cfm/sq. ft. at the tested pressure differential of 0.3- inch wg of water.

2.3 SCHEDULED DOOR HARDWARE

- A. General: Provide door hardware for each door to comply with requirements in this Section and the Door Hardware Sets at the end of Part 3.
 - 1. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:

- a. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements.
- b. The following is a list of the Basis of Design Manufacturers:

Item	Manufacturer
Hinges	Markar & Stanley (Best)
Locksets, Cylinders and Cores	Best
Pull/Pull Plates	Rockwood
Kick Plates	Rockwood
Armor Plates	Rockwood
Closers	LCN
Thresholds	Reese & Pemko
Door Stops/Wall Bumpers	IVES & Rockwood
Exit Devices	Best (Precision)
Weatherstripping	Reese & Pemko
Keying Control System	Best
Security Astragal, "TEE" Type	Markar
Surface Bolts	IVES
Padlocks	Master
Overhead Holder	LCN
Lock Guards	Markar
Key Removable Mullion	Best (Precision)

- 2. Substitutions to the Basis of Design list of Manufacturers:
 - a. Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, the *Philadelphia Parks and Recreation Department*, and their designated consultants.

2.4 HINGES

- A. Manufacturers: Basis of Design provide products by Markar & Stanley
 - 1. Subject to compliance with requirements, products by one of the following manufacturers may be submitted under the provisions of Division 01, Substitution Procedures.
 - a. Butt Hinges:

- 1) Hager Companies.
- 2) McKinney Products
- 3) Stanley (Best).

- b. Continuous Barrel Hinges:
- 1) McKinney Products.
 - 2) Pemko Manufacturing.
 - 3) Stanley (Best)
 - 4) Markar

B. Standards: Certified products complying with the following:

1. Butts and Hinges: ANSI/BHMA A156.1.
2. Continuous Barrel Hinges: ANSI/BHMA A156.26.
3. Template Hinge Dimensions: ANSI/BHMA A156.7.

C. Quantity: Provide the following hinge quantity, unless otherwise indicated:

1. Two Hinges: For doors with heights up to 60 inches.
2. Three Hinges: For doors with heights 61 to 90 inches.
3. Four Hinges: For doors with heights 91 to 120 inches.
4. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.

D. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:

Maximum Door Size (inches)	Hinge Height (inches)	Metal Thickness (inches)	
		Standard Weight	Heavy Weight
Up to 48-in by 120-in by 1-3/4	4-1/2	0.134	0.180
48-in by up to 120-in by 1-3/4	5	n/a	0.190

E. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:

1. Exterior Doors: Heavy weight, stainless steel barrel type hinge
2. Interior Doors: Standard weight, steel, ball bearing hinges unless Hardware Sets indicate heavy weight.

F. Hinge Options: Comply with the following where indicated in the Hardware Sets or on Drawings:

1. Non-removable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the following applications:
2.
 - a. Out-swinging access controlled doors.

G. At Aluminum Entrances and Storefronts: Continuous-Geared Hinges: Minimum 0.120-inch thick extruded 6060 T6 aluminum alloy hinge leaves with a minimum overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations. Provide concealed flush mount (with or without inset), full surface, and half surface, in standard and heavy duty models, as specified in the door hardware sets. Concealed continuous hinges to be U.L. listed for use on up to and including 90 minute rated door installations. Factory cut hinges for door size and provide with removable service power transfer panel where indicated at electrified openings.

2.5 DOOR OPERATING TRIM

A. Manufacturers: Basis of Design provide products by Best

1. Subject to compliance with requirements, products by one of the following manufacturers may be submitted under the provisions of Division 01, Substitution Procedures.
 - a. Surface Bolts and Flushbolts:
 - 1) Door Controls International.
 - 2) Rockwood Manufacturing
 - 3) Trimco Hardware
2. Standards: Comply with the following:
 - a. Surface Bolts: BHMA A156.16.
 - b. Automatic and Self-Latching Flush Bolts: BHMA A156.3.
 - c. Manual Flush Bolts: BHMA A156.16.
3. Surface Bolts and Flush Bolts: BHMA Certified Grade 1.
4. Provide manual flush bolts with top rod of sufficient length to allow bolt location approximately six feet from the floor. Furnish dust proof strikes for bottom bolts. Surface bolts to be 8" in length and U.L. listed for labeled fire doors.
5. Bolt Throw: Comply with testing requirements for length of bolts to comply with labeled fire door requirements, and as follows:
 - a. Mortise Flush Bolts: Minimum 3/4-inch throw.

2.6 LOCKS AND LATCHES

A. Manufacturers: Basis of Design provide products by Best 47H series.

1. Subject to compliance with requirements, products by one of the following manufacturers may be submitted under the provisions of Division 01, Substitution Procedures.
 - a. Mechanical Mortise Locks and Latches:
 - 1) Sargent Manufacturing - 8200 Series.
 - 2) Schlage - L9000 Series

B. Standards: Comply with the following:

1. Mortise Locks and Latches: BHMA A156.13, Certified Grade 1, Series 1000.

C. Lock Trim: Match the following design style:

1. Levers:
 - a. Best 14R Lever

D. Lock Functions: Function numbers and descriptions indicated in the Door Hardware Schedule comply with the following:

1. Mortise Locks: BHMA A156.13.

E. Lock Throw: Comply with testing requirements for length of bolts to comply with labeled fire door requirements, and as follows:

1. Mortise Locks: Minimum 3/4-inch latchbolt throw.

F. Backset: 2-3/4 inches unless otherwise indicated.

2.7 CYLINDERS AND KEYING

A. Basis of Design Manufacturer: Subject to compliance with requirements, provide products by Best.

B. Standards: Comply with the following:

1. Cylinders: BHMA A156.5 Certified Grade 1.

C. Cylinders: Cylinders complying with the following:

1. Mortise Type: Threaded cylinders with rings and straight- or clover-type cam.

2. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.

3. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.

D. Construction Master keying: Furnish construction master keyed cylinders or temporary keyed construction cores.

1. General Contractor to provide permanent cores to Philadelphia Parks & Recreation.

E. Construction Master Keys: Provide cylinders with feature that permits voiding of construction keys without cylinder removal. Provide 10 construction master keys.

F. Construction Cores: Provide construction cores that are replaceable by permanent cores. Provide 10 construction master keys.

G. Contractor to establish a keying meeting for final keying of the permanent cores. Meeting to include the factory representative for Best and the representative for *Philadelphia Parks recreation Department*.

H. Key Control System: Provide lockable cabinet for key control and storage as indicated in Hardware Sets.

I. All door locks shall be master keyed to the PPR's master keying system incorporating completely removable and interchangeable cylinder cores. The interchangeable cores shall be removable by a special control key.

J. Furnish construction cores during the period of construction using only construction keys. Upon date established by the Architect or Engineer, void construction core system and install specified keying system.

K. All lock shall be grand master keyed and master keyed to the specifications of the *Philadelphia Parks and Recreation Department*. All permanent cores, shall be installed seven (7) days before the final inspection. All keys and permanent cores, shall be shipped directly from the manufacturer (Best) to the *Philadelphia Parks and Recreation Department* only. All locks shall be supplied to the contractor with temporary construction cores for use by the contractor during the construction period.

L. All mortise lock-sets shall be of heavy duty series and shall meet ANSI A156 Series 1000, Grade 1 operational and Grade 1 security.

M. Locks must be supplied with cores and keys to match existing system.

N. The master key system where required shall be a factory registered system to insure the propriety of the codes and avoid duplication or cross-keying.

O. Provide ten extra keyed interchangeable cores for each master keyed group.

- P. Lock-sets and latch-sets shall be heavy duty mortise type with hinged, antifriction, ¾ inch throw latch- bolt with antifriction piece made of self lubricating stainless steel. The lock body cover will have five screw fasteners. Functions and design as indicated in the hardware groups. Functions shall be one inch projection with two hardened steel roll pins and concealed mounting.
- Q. Permanent keys and cores will be stamped with the applicable key mark for identification. Mark the side of every core with the key mark.
- R. Lock-sets and cores to be of the same manufacturer to maintain complete lockset warranty.
- S. Deadbolts shall have no exposed mounting screws. Screws shall be covered by the trim plate that shall be detachable only after the core is removed.
- T. All cores shall be high security type, Best®. They shall be removable from all lock-sets by Special Control Key. Also, the removable core must be instantly interchangeable without modification for use in any lock throughout this system.
- U. Furnish two individual keys for each lock.
- V. Furnish keys (for each building) in the following quantities:
 - 1. 6 master keys.
 - 2. 2 control keys.
 - 3. 2 construction keys.
 - 4. 2 Individual keys for each.
 - 5. 2 Grandmaster keys.

2.8 STRIKES

- A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:
 - 1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
 - 2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
 - 3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
- B. Standards: Comply with the following:
 - 1. Strikes for Mortise Locks and Latches: BHMA A156.13.
 - 2. Dustproof Strikes: BHMA A156.16.

2.9 EXIT DEVICES

- A. Manufacturers: Basis of Design provide products by Falcon.
 - 1. Subject to compliance with requirements, products by one of the following manufacturers may be submitted under the provisions of Division 01, Substitution Procedures.
 - a. Best – Precision – Apex Series
 - b. Sargent Manufacturing - 80 Series.
 - c. Von Duprin - 35A/98 Series.
- B. Standard: BHMA A156.3, Certified Grade 1.
- C. Panic Exit Devices: Listed and labeled by a testing and inspecting agency acceptable to authorities having

jurisdiction, for panic protection, based on testing according to UL 305.

- D. Fire Exit Devices: Complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire and panic protection, based on testing according to UL 305 and NFPA 252.
- E. Outside Trim: Match design for locksets and latchsets, unless otherwise indicated.
- F. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.

2.10 ACCESSORIES FOR PAIRS OF DOORS

- A. Manufacturers: Basis of Design provide products by Falcon
 - 1. Subject to compliance with requirements, products by one of the following manufacturers may be submitted under the provisions of Division 01, Substitution Procedures.
 - 2. Keyed Removable Mullions:
 - a. Falcon
 - b. Best Precision
 - c. Sargent Manufacturing.
 - d. Von Duprin.

- B. Standards: Comply with the following:

- 1. Coordinators: BHMA A156.3.
- 2. Removable Mullions: BHMA A156.3.

- C. Fire-Exit Removable Mullions: Provide keyed removable mullions for use with fire exit devices complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire and panic protection, based on testing according to UL 305 and NFPA 252. Mullions shall be used only with exit devices for which they have been tested.

2.11 CLOSERS

- A. Manufacturers: Basis of Design provide products by LCN 4500 Series.
 - 1. Subject to compliance with requirements, products by one of the following manufacturers may be submitted under the provisions of Division 01, Substitution Procedures.
 - 2. Surface-Mounted Closers (Heavy Duty):
 - a. Best - EHD9000 series with heavy duty arms and security fasteners.
 - b. Norton Door Controls - 7500 Series with heavy duty arms and security fasteners.
 - c. Sargent Manufacturing - 351 Series with heavy duty arms and security fasteners.

- B. Standards: Comply with the following:

- 1. Surface Closers: BHMA A156.4, Certified Grade 1.

- C. Size of Units: Unless otherwise indicated, comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide non-handed, factory-sized closers adjustable to meet field conditions and requirements for opening force.

- D. Closer Options: As indicated in hardware sets, provide door closer options including: delayed action, hold open arms, extra duty parallel arms, positive stop/hold open arms, compression stop/hold open arms, special mounting brackets, spacers and drop plates. Through bolt type mounting is required as indicated in the door hardware sets.

2.12 OPERATING AND PROTECTIVE TRIM UNITS

- A. Manufacturers: Basis of Design provide products by Rockwood

1. Subject to compliance with requirements, products by one of the following manufacturers may be submitted under the provisions of Division 01, Substitution Procedures.
 - a. Metal and Plastic Protective Trim Units:
 - 1) Burns Manufacturing
 - 2) Trimco Manufacturing
 - b. Door Pulls:
 - 1) Burns Manufacturing
 - 2) Trimco Manufacturing.
2. Standard: BHMA Certified A156.6.
3. Materials: Fabricate protection plates from the following:
 - a. Stainless Steel: .050 inches thick, beveled four sides (B4E) with countersunk screwholes.
 - b. Furnish protection plates sized two inches less than door width (LDW) on push side and by height specified in door hardware sets.
4. Push/Pull Plates: .050 inch thick, 4 inches wide by 16 inches high with square corners and beveled edges, secured with exposed screws.
 - a. Straight Pull Design: 1-inch round diameter with 10-inch centers and 1 1/2-inch clearance from face of door.
 - b. Offset Pull Design: 1-inch round diameter pull, with 10-inch centers and clearance of 1-1/2 inches from face of door with offset of 45 degrees.
5. Fasteners: Provide manufacturer's designated fastener type as indicated in door hardware sets.

2.13 STOPS AND HOLDERS

- A. Manufacturers: Basis of Design provide products by Rockwood

1. Subject to compliance with requirements, products by one of the following manufacturers may be submitted under the provisions of Division 01, Substitution Procedures.
 - a. Stops and Holders:
 - 1) Burns Manufacturing
 - 2) Trimco Manufacturing.
 - b. Combination Overhead Stops and Holders:
 - 1) Glynn-Johnson - 100 Concealed and 90 Surface Series
 - 2) Sargent Hardware - 600 Concealed and 500 Surface Series.

2. Standards: Comply with the following:
 - a. Stops and Bumpers: BHMA A156.16, Certified Grade 1.
 - b. Combination Overhead Holders and Stops: BHMA A156.8, Certified Grade 1.
3. Stops and Bumpers: Provide wall stops for all doors unless floor or other type stops are scheduled or indicated. Do not mount floor stops where they will impede traffic. Where floor or wall stops are not appropriate, provide overhead stops and/or holders. Whenever possible, use wall bumpers or dome type door stops. Where it is impractical to use wall stops or bumper, furnish floor type door stops. Wall bumpers suitable to typical substrate - 402.5 or 403.5 by Ives; 403 or 405 by Rockwood.
4. Silencers for Metal Door Frames: BHMA Grade 1; neoprene or rubber, minimum diameter 1/2 inch fabricated for drilled-in application to frame. Provide (3) per single door and (2) per paired door frame if applied gasketing is not specified in Hardware Sets.

2.14 DRIP CAP

- A. Drip cap to be 16 ga. Stainless Steel 1.5" by 1.5" by full width of door opening. Installed on frame above door opening in full bed of sealant, with fasteners at 3" O.C.

2.15 RAIN DRIP

- A. Manufacturers: Basis of Design provide products by Reese.
- B. Drip cap to be aluminum 1.5" by 9/16" by full width of door opening. Installed on frame above door opening in full bed of sealant, with fasteners at 3" O.C.

2.16 DOOR THRESHOLDS, WEATHERSTRIPPING AND GASKETING

- A. Manufacturers: Basis of Design provide products by Reese & Pemko
 1. Subject to compliance with requirements, products by one of the following manufacturers may be submitted under the provisions of Division 01, Substitution Procedures.
 2. Door Thresholds, Weatherstripping and Gasket Seals:
 - a. National Guard Products
 - b. Zero.
- B. Standard: Comply with BHMA A156.22.
- C. General: Provide continuous weatherstrip seal on exterior doors and smoke, light, or sound gasketing on interior doors where specified. Provide non-corrosive fasteners for exterior applications.
 1. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame. Install header seal before mounting door closer arms.
 2. Meeting Stile Astragals: Fasten to meeting stiles, forming seal when doors are closed.
 3. Door Sweep: Apply to bottom of door, forming seal with threshold when door is closed.
- D. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.

1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.
- E. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.
1. Intumescent Seals and Gasketing: Provide concealed, Category A type gasketing systems on assemblies where an intumescent seal is required to meet IBC and UL-10C positive pressure labeling.
- F. Thresholds
1. Thresholds: BHMA A156.21; fabricated to full width of opening indicated.
 2. Compressing-Top Thresholds: Metal member with compressible vinyl seal on top of threshold that seals against bottom of door; and base metal of aluminum.
 3. Saddle Thresholds:
 - a. Type: Fluted top, barrier free.
 - b. Base Metal: Aluminum.
 4. Half-Saddle Thresholds: Fluted-top metal member; and base metal of aluminum.
 5. Provide a pre-drilled (countersunk) aluminum floor plate threshold as scheduled. Thresholds shall be an assembled unit comprised of two supports and a floor plate and one or two pair of mitered returns (when wider than the wall's width). All components shall anchored to substrate with ¼" Hollow Set Drop-In anchors, and laid in a full bed of high strength cement grout. Thresholds shall satisfy the following conditions for sizing and installation according to substrate, finish floor, interior/exterior grades, frame opening and masonry opening:
 6. Thresholds shall cover all interior and exterior slab joints, extending at least 1" beyond them.
 7. Thresholds shall cover a ½" minimum of the edge of the finish floor.
 8. The threshold's length shall be equal to the width of the masonry opening where it is scheduled to be installed, and shall be cut neatly to fit around jambs. Also, it shall be as wide as the width of the wall that contains the masonry opening (two plates may be required), and no more than ¼" larger on each side.
 9. Threshold shall be installed o.c. of masonry opening.
 10. When a difference on grades between the interior and the exterior edges of the threshold occurs, provide supports of dissimilar heights to correct the differential on grades.
 11. When thresholds' width extend beyond the width's requirements stated in condition 03 above, to satisfy conditions 01 and 02 also above, they shall have a miter returns on both ends. Miter return's corners shall have a miter joint continuously welded and ground smooth. All miter returns shall abut against the walls.
 12. Tolerance for all joints and seams of the assembled components shall be lesser 1/32".

2.17 KEYS HOUSING BOX

- A. Provide at each facility one key cabinet, master keyed to building system. Cabinet shall be made of sheet metal with a baked enamel finish, colored as selected by the Architect or Engineer; it shall have the capacity to handle this Project plus 25 percent expansion. Cabinet to include Best 1EJ74 cabinet lock with interchangeable core.
- B. Regent model #RWC 25S by Tel-Kee.

2.18 FASTENERS

- A. Furnish necessary screws, bolts, and other fasteners of suitable size and type to anchor the hardware in position for long life and hard use. Use one way or Torx pin-head screws on all hardware.

- B. Where necessary, furnish fasteners with toggle bolts, expansion shields, sex bolts, and other anchors approved by the Architect or Engineer, according to the material to which the hardware is to be applied and according to the recommendations of the hardware manufacturer.
- C. Setting of fasteners shall not be done into or by-mean-of “adjusta-screws”. Manufacturers’ recommended fasteners will be driven into the pre-tapped holes for fully templates mortised hardware, following an approved hardware schedule and templates.
- D. Provide fasteners which harmonize with the hardware as to finish and materials.

2.19 SHOP CUTS

- A. Any cutting must be done in the manufacturer shop. No field cutting will be accepted. This applies, but not limited to armor, push, pull and kick plates; also, frames and doors.
- B. Indicate on shop drawings submission the location of shop cuts, punches and perforations. This applies, but not limited to armor, push, pull and kick plates; also, frames and doors.

2.20 WELDING

- A. All welding shall be of continuous type. Provide filler wire similar to the material being welded. All welding shall be ground smooth to blend with the surrounding finish.

2.21 FINISHES

- A. Provide finishes complying with BHMA A156.18 as indicated in door hardware schedule.
- B. Finish hardware, except as otherwise noted, to be of stainless steel with US32D finish. Where items are not manufactured in stainless steel, dull chrome US26D shall be furnished.
- C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- D. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance of the Work.
- B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
- C. Notify architect of any discrepancies or conflicts between door schedule, door types, drawings and scheduled hardware. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Steel Doors and Frames: For surface-applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.

3.3 INSTALLATION

- A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.
 - 1. Contractors' installers are to be trained and certified by a door hardware manufacturer representative on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.
- B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated in attachment for Hardware Mounting Heights. or required to comply with governing regulations:
 - 1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
 - 2. Custom Steel Doors and Frames: HMMA 831.
 - 3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
- C. Boxed Power Supplies: Verify locations with Architect.
 - 1. Configuration: Provide the least number of power supplies required to adequately serve doors with access control equipment.
- D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."
- E. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work. Do not install surface-mounted items until finishes have been completed on substrates involved.
 - 1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
 - 2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- F. Hinges: Install types and in quantities indicated in door hardware schedule, but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30 inches of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.
- G. Final cores to be installed by PPR: Install construction cores to secure building and areas during construction period.
 - 1. Replace construction cores with permanent cores as directed by PPR.
- H. Key Control System:

1. Key Control Cabinet: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.
 2. Key Lock Boxes: Install where indicated or approved by Architect to provide controlled access for fire and medical emergency personnel.
 3. Key Control System Software: Set up multiple-index system based on final keying schedule.
- I. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they will impede traffic.
- J. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
1. Do not notch perimeter gasketing to install other surface-applied hardware.
- K. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
- L. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.
- 3.4 FIELD QUALITY CONTROL
- A. Field Inspection: Supplier will perform a final inspection of installed door hardware and state in report whether work complies with or deviates from requirements, including whether door hardware is properly installed, operating and adjusted.
- 3.5 ADJUSTING
- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
1. Door Closers: Adjust sweep period so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the leading edge of the door.
- B. Six-Month Adjustment: Approximately six months after date of Substantial Completion, Installer shall perform the following:
1. Examine and readjust each item of door hardware as necessary to ensure function of doors, door hardware, and electrified door hardware.
 2. Consult with and instruct *Philadelphia Parks and Recreation Department's* personnel on recommended maintenance procedures.
 3. Replace door hardware items that have deteriorated or failed due to faulty design, materials, or installation of door hardware units.
- 3.6 CLEANING AND PROTECTION
- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items as necessary to restore proper function and finish, provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of *Philadelphia Parks and Recreation Department* occupancy.
- 3.7 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions for PPR's continued adjustment, maintenance, and removal and replacement of door hardware.
- B. Maintenance Service: Beginning at Substantial Completion, maintenance service shall include nine months' full maintenance by skilled employees of door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door and door hardware operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

3.8 DEMONSTRATION

- A. Engage a factory-authorized representative to train *Philadelphia Parks and Recreation Department's* maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware

3.9 DOOR HARDWARE SETS

- A. The hardware sets listed below represent the design intent and direction of the *Philadelphia Parks and Recreation Department* and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process.

Hdwe. Set: 01		HMD x HMF UL- 45		
Door: B03.2				
Pair to have				
Qty	Description	Manufacturer Model	Fin.	Man.
6	Hinges	IHTCB1961R 4.5 x 4.5	630	BE
1	Key Removeable Mullion	KRF4023	PTD	FA
1	Exit Device	F-25-R-511L	630	FA
1	Trim Cylinder & Core	Rim Type	626	BE
1	Exit Device	F-25-R-511EO	630	FA
2	Door Closer w/Stop	4211 HCUSH 4210-30/4210-61	AL	LCN
2	Kick Plates	K0064 12" x 2" LDW CSK torx	630	TR
1	Gasketing	BlazeSeal (Head & Jambs)	BLK	RE

Hdwe. Set: 02		HMD x HMF UL- 45		
Door: B03.1, B04				
Sgl to have				
Qty	Description	Manufacturer Model	Fin.	Man.
3	Hinges	IHTCB1961R 4.5 x 4.5	630	BE
1	Storeroom Lockset	45H7D14R	630	BE
1	Door Closer w/Stop	4211 HCUSH 4210-30/4210-61	AL	LCN
1	Kick Plate	K0064 12" x 2" LDW CSK torx	630	TR
3	Silencers	BlazeSeal (Head & Jambs)	BLK	RE

Hdwe. Set: 03				
Door: B05, B08, 103				
Sgl to have				
Qty	Description	Manufacturer Model	Fin.	Man.

3	Hinges	IHTCB1961R 4.5 x 4.5	630	BE
1	Storeroom Lockset	45H7D14R	630	BE
1	Door Closer	4511	AL	LCN
1	Wall Bumper	1270CXPV	630	TR
1	Kick Plate	K0064 12" x 2" LDW CSK torx	630	TR
3	Silencers	1229A	GR	RO

Hdwe. Set: 04		HMD x HMF 90 min.		
Door: S1-B, S1-1.1, S1-1.2, S1-2.1, S1-3, S2-B.2, S2-1.1, S2-2.1, S2-3				
Sgl to have				
Qty	Description	Manufacturer Model	Fin.	Man.
3	Hinges	IHTCB1961R 4.5 x 4.5	630	BE
1	Exit Device	F-25-R-510L-BE	630	FA
1	Door Closer	4211 CUSH 4210-30/4210-61	AL	LCN
1	Kick Plate	K0064 12" x 2" LDW CSK torx	630	TR
1	Gasketing	BlazeSeal (Head & Jamb)	BLK	RE

Hdwe. Set: 05		60 min.		
Door: S2-B.1				
Pair to have				
Qty	Description	Manufacturer Model	Fin.	Man.
6	Hinges	IHTCB1961R 4.5 x 4.5	630	BE
2	Flush Bolts	3917	626	TR
1	Dust Proof Strike	3910N	626	TR
1	Storeroom Lockset	45H7D14R 7/8 LTC Strike	630	BE
1	Door Closer w/Stop	4211 CUSH 4210-30/4210-61	AL	LCN
1	Overhead Stop/Holder	9000	630	ABH
1	Door Coordinator	3094 x Mtg. Brkt.	PTD	TR
1	Astragal	By HM Manufacturer if required	PTD	
2	Kick Plates	K0064 10" x 2" LDW CSK torx	630	TR
1	Gasketing	BlazeSeal (Head & Jamb)	BLK	RE

Hdwe. Set: 06		ALD x ALF Entrance		
Door: 100A.1				
To have				
Qty	Description	Manufacturer Model	Fin.	Man.
2	Continuous Hinges	661HD	AL	BE
1	Wired Key Removeable Mullion	KR4854	PTD	VD
1	Mullion Cylinder & Core	Mortise Type	626	BE
1	Electric Strike	6111	630	VD
1	Power Supply	By Intercom system		
1	Intercom	By Security Contractor		
1	Exit Device	CD-25-R-NL-OP	630	FAL
1	Trim Cylinder & Core	Rim Type	626	BE
1	Exit Device	CD-25-R-EO	630	FA
2	Dogging Cylinders & Cores	Mortise Type	626	BE
2	Door Pulls	1191-4	630	TR

2	Door Closers	4211 4210-30/4210-61	AL	LCN
2	Overhead Stops	1000SL series	630	ABH
1	Threshold	896ADJ SIA ssms/ea	AL	NA
2	Door Sweeps	353A	AL	RE
Operational Description: Entrance via mechanical key unless the exit devices are dogged via mechanical key. Egress at all times via exit device touchbar. When doors are locked and secure the electric strike at active door leaf may be released by intercom located at Office# 112 to allow entrance. Note: Weather seals by aluminum door & frame manufacturer.				

Hdwe. Set: 07 ALD x ALF Entrance				
Door: 100B.1,				
To have				
Qty	Description	Manufacturer Model	Fin.	Man.
2	Continuous Hinges	661HD	AL	BE
1	Key Removeable Mullion	KR2923	PTD	FAL
1	Mullion Cylinder & Core	Mortise Type	626	BE
1	Exit Device	CD-25-R-NL-OP	630	FAL
1	Trim Cylinder & Core	Rim Type	626	BE
1	Exit Device	CD-25-R-EO	630	FA
2	Dogging Cylinders & Cores	Mortise Type	626	BE
2	Door Pulls	1191-4	630	TR
2	Door Closers	4211 4210-30/4210-61	AL	LCN
2	Overhead Stops	1000SL series	630	ABH
1	Threshold	896ADJ SIA ssms/ea	AL	NA
2	Door Sweeps	353A	AL	RE
Note: Weather seals by aluminum door & frame manufacturer.				

Hdwe. Set: 08 ALD x ALF				
Door: 100B.2, 102.1				
To have				
Qty	Description	Manufacturer Model	Fin.	Man.
2	Continuous Hinges	661HD	689	BE
1	Key Removeable Mullion	KR2923	PTD	FA
1	Mullion Cylinder & Core	Mortise Type	626	BE
1	Exit Device	CD-25-NL-OP	630	FA
1	Trim Cylinder & Core	Rim Type	626	BE
1	Exit Device	CD-25-EO	630	FA
2	Dogging Cylinders & Cores	Mortise Type	626	BE
2	Door Pulls	1191-4	630	TR
2	Door Closers	4211 4210-30/4210-61	AL	LCN
2	Overhead Stops	1000SL series		
Note: Weather seals by aluminum door & frame manufacturer.				

Hdwe. Set: 09 ALD x ALF Vestibule				
Door: 100A.2				
To have				
Qty	Description	Manufacturer Model	Fin.	Man.
2	Continuous Hinges	661HD	AL	BE

1	Dummy Touch Bar	250DT	630	FA
2	Door Pulls	1191-4	630	TR
2	Door Closers	4211 CUSH 4210-30/4210-61	AL	LCN
Note: Weather seals by aluminum door & frame manufacturer.				

Hdwe. Set: 10		Exterior Single Exit		
Door: 107, S1-1.3, S2-1.3				
To have				
Qty	Description	Manufacturer Model	Fin.	Man.
1	S/S Continuous Hinges	HG-305 NRP	630	MA
1	Exit Device	CD-25-M-511L-3 SUT	63	FA
1	Trim Cylinder & Core	1E7K4-32-S2	626	BE
1	Extended Cylinder	1E72	626	BE
1	Security Astragal	EG-T-308 (Continuous)	SS	MA
1	Door Closer	4211 CUSH 4210-30/4210-61	AL	LCN
1	Kick Plate	K0064 12" x 1½" LDW torx	630	TR
1	Armor Plate	AR064 36" x 1½" LDW torx	630	RO
1	Threshold	234 & 280A ssms/ea	AL	RE
1	Door Sweeps	353A	AL	NA
1	Weather Seals	807A	AL	RE
1	Drip Cap	R199A	AL	RE

Hdwe. Set: 11				
Door: 120.1				
Sgl to have				
Qty	Description	Manufacturer Model	Fin.	Man.
3	Hinges	IHTCB1961R 4.5 x 4.5	630	BE
1	Classroom Lockset	45H7R14R	630	BE
1	Door Closer w/Stop	4211 CUSH 4210-30/4210-61	AL	LCN
1	Kick Plate	K0064 12" x 2" LDW CSK torx	630	TR
3	Silencers	20	GR	RO

Hdwe. Set: 12				
Door: 105, 106				
To have				
Qty	Description	Manufacturer Model	Fin.	Man.
3	Hinges	IHTCB1961R 4.5 x 4.5	630	BE
1	Deadlock	83T-7 (5C7DD) S-S1	626	BE
1	Pull	93 8"x16" CFC torx	630	RO
1	Push Plate	73F 8"x16" CFTT torx	630	RO
1	Door Closer	4211H-CUSH	AL	LCN
1	Kick Plate	K0050 12" x 2" LDW CSK torx	630	TR
1	Mop Plate	KM064 12" x 1" LDW CSK torx	630	TR
3	Silencers	20	GR	RO
1	Men or Women Signage	BF684 or BF685	US26D	RO

Hdwe. Set: 13				
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Door: 102C, 202A				
Pair to have				
Qty	Description	Manufacturer Model	Fin.	Man.
6	Hinges	IHTCB1961R 4.5 x 4.5	630	BE
2	Roller Latches	1895	626	AB
2	Flush Bolts	3917	626	TR
1	Dust Proof Strike	3810	630	TR
1	Deadlock	83T7L	626	BE
2	Pulls	93	630	RO
1	Overhead Stop/Holder	9000 series	26D	DO
2	Silencers	20	GR	RO

Hdwe. Set: 14				
Door: 109, 120.2				
Sgl to have				
Qty	Description	Manufacturer Model	Fin.	Man.
3	Hinges	IHTCB1961R 4.5 x 4.5	630	BE
1	Classroom Lockset	45H7R14R	630	BE
1	Door Closer	4511 CUSH @ Door# 120.2	AL	LCN
1	Door Closer	4511 @ Door# 109	AL	LCN
1	Overhead Stop	4000 series	626	ABH
1	Kick Plate	K0050 10" x 2" LDW CSK torx	630	TR
3	Silencers	20	GR	RO

Hdwe. Set: 15				
Door: 111, 112, 115B, 202B, 203A				
Sgl to have				
Qty	Description	Manufacturer Model	Fin.	Man.
3	Hinges	IHTCB1961R 4.5 x 4.5	630	BE
1	Classroom Lockset	45H7R14R	630	BE
1	Wall Bumper	1270CXPV	630	TR
1	Coat Hook	3070 (Doors# 111, 112 only)		
3	Silencers	20	GR	RO

Hdwe. Set: 16				
Door: 109A				
Sgl to have				
Qty	Description	Manufacturer Model	Fin.	Man.
3	Hinges	IHTCB1961R 4.5 x 4.5	630	BE
1	Classroom Lockset	45H7R14R	630	BE
1	Overhead Stop	9000 series	630	ABH
3	Silencers	20	GR	RO

Hdwe. Set: 17				
Door: 104, 114, 204, 205				
Sgl to have				
Qty	Description	Manufacturer Model	Fin.	Man.

3	Hinges	IHTCB1961R 4.5 x 4.5	630	BE
1	Privacy Set	9K3YT15D	630	BE
1	Kick Plate	K0064 12" x 2" LDW CSK torx	630	TR
1	Mop Plate	KM0064 12" x 1" LDW CSK torx	630	TR
1	Wall Bumper	1270CXPV	630	TR
3	Silencers	20	GR	RO
1	Unisex ADA Signage	BF689	US26D	RO

Hdwe. Set: 18				
Door: 113, 115, 116, 121, 201, 202, 203.1				
Sgl to have				
Qty	Description	Manufacturer Model	Fin.	Man.
3	Hinges	IHTCB1961R 4.5 x 4.5	630	BE
1	Intruder Lockset	45H7INL14R	630	BE
1	Kick Plate	K0064 12" x 2" LDW CSK torx	630	TR
1	Wall Bumper	1270CXPV	630	TR
3	Silencers	20	GR	RO

Hdwe. Set: 19				
Exterior ALD x ALF				
Door: 117.1				
To have				
Qty	Description	Manufacturer Model	Fin.	Man.
1	Continuous Hinge	661HD	AL	ST
1	Exit Device	CD-25-R-NL-OP	630	FAL
1	Trim Cylinder & Core	Rim Type	626	BE
1	Exit Device	CD-25-R-EO	630	FA
1	Dogging Cylinder & Core	Mortise Type	626	BE
1	Door Pull	1191-4	630	TR
1	Door Closer	4211 CUSH 4210-30/4210-61	AL	LCN
1	Overhead Stop	1000SL series	630	AB
1	Kick Plate	K0064 12" x 2" LDW CSK torx	630	TR
1	Threshold	896ADJ SIA ssms/ea	AL	NA
1	Door Sweep	353A	AL	RE
1	Weather Seals	807 (head & jambs)	AL	RE
1	Rain Drip	R199A	AL	NA

Hdwe. Set: 20				
Door: 118.1, 118.2, 117.3				
Sgl to have				
Qty	Description	Manufacturer Model	Fin.	Man.
3	Hinges	IHTCB1961R 4.5 x 4.5	630	BE
1	Exit Device	CD-25-511L SUT	630	FA
1	Trim Cylinder & Core	Rim Type	626	BE
1	Dogging Cylinder & Core	Mortise Type	626	BE
1	Door Closer w/Stop	4211 CUSH 4210-30/4210-61	AL	LCN
1	Kick Plate	K0064 12" x 2" LDW CSK torx	630	TR
3	Silencers	20	GR	RO

Hdwe. Set: 21				
Door: 121A.1, 121A.2, 122A				
Pair to have				
Qty	Description	Manufacturer Model	Fin.	Man.
6	Hinges	IHTCB1961R 4.5 x 4.5	630	BE
2	Flush Bolts	3917	626	TR
1	Dust Proof Strike	3910N	626	TR
1	Deadlock	48H7R	626	BE
2	Pulls	93	630	RO
2	Overhead Stop/Holder	3300 series	26D	ABH
2	Silencers	20	GR	RO

Hdwe. Set: 22				
Door: 200A				
Sgl to have				
Qty	Description	Manufacturer Model	Fin.	Man.
3	Hinges	IHTCB1961R 4.5 x 4.5	630	BE
1	Storeroom Lockset	45H7D14R	630	BE
1	Overhead Stop	3300 series	626	DO
3	Silencers	20	GR	RO

Hdwe. Set: 23		Exterior - Roof		
Door: 203.2				
Sgl o have				
Qty	Description	Manufacturer Model	Fin.	Man.
1	Continuous Hinge	HG-305 NRP	630	MA
1	Storeroom Lockset	45H7D14R (key on push side)	630	BE
1	Door Closer	4211 CUSH 4210-30/4210-61	AL	LCN
1	Overhead Stop	1000SL series	630	ABH
1	Kick Plate	K0064 12" x 2" LDW CSK torx	630	TR
1	Security Astragal	EG-T-308	SS	MA
1	Threshold	896ADJ SIA ssms/ea	AL	NA
1	Door Sweep	353A	AL	RE
1	Weather Seals	807 (head & jambs)	AL	RE
1	Rain Drip	199A	AL	RE

Hdwe. Set: 24				
Door:110				
Sgl to have				
Qty	Description	Manufacturer Model	Fin.	Man.
3	Hinges	IHTCB1961R 4.5 x 4.5	630	BE
1	Privacy Set	9K3YT15D	630	BE
1	Kick Plate	K0064 12" x 2" LDW CSK torx	630	TR
1	Mop Plate	MP0064 6" x 1" LDW CSK torx	630	TR
1	Wall Bumper	1270CXPV	630	TR
3	Silencers	20	GR	RO
1	Unisex ADA Signage	BF689	626	RO

Hdwe. Set: 25				
Door: 102.3				
To have				
Qty	Description	Manufacturer Model	Fin.	Man.
2	Continuous Hinges	HG-305 NRP	630	MA
1	Removeable Mullion	KR2923	PTD	FAL
1	Mullion Cylinder & Core	Mortise Type	626	BE
2	Alarmed Exit Devices	CD-25-R-EO	630	FAL
2	Door Closers	4211 4210-30/4210-61	AL	LCN
2	Overhead Stops	1000SL series	630	ABH
2	Armor Plates	A0064 36" x 1" LDW CSK torx	630	TR
1	Threshold	896ADJ SIA ssms/ea	AL	NA
2	Door Sweeps	353A	AL	RE

Hdwe. Set: 26				
Door: 102A.1, 102B				
Pair to have				
Qty	Description	Manufacturer Model	Fin.	Man.
6	Hinges	IHTCB1961R 4.5 x 4.5	630	BE
2	Roller Latches	1895	626	AB
2	Flush Bolts	3917	626	TR
1	Dust Proof Strike	3810	630	TR
1	Deadlock	83T7L	626	BE
2	Pulls	93	630	RO
2	Armor Plates	A0064 36" x 1" LDW CSK torx	630	TR
1	Overhead Stop/Holder	9000 series	26D	DO
2	Silencers	20	GR	RO

Hdwe. Set: 27			Roll Up Counter Do	
Door: 102A.2				
To have				
Qty	Description	Manufacturer Model	Fin.	Man.
1	Cylinder & Core	As Required		BE

Hdwe. Set: 28			Exterior Single Exit	
Door: 102.2				
To have				
Qty	Description	Manufacturer Model	Fin.	Man.
1	S/S Continuous Hinges	HG-305 NRP	630	MA
1	Alarmed Exit Device	CD-25-M-511L-3 SUT	63	FA
1	Trim Cylinder & Core	1E7K4-32-S2	626	BE
1	Extended Cylinder	1E72	626	BE
1	Security Astragal	EG-T-308 (Continuous)	SS	MA
1	Door Closer	4211 CUSH 4210-30/4210-61	AL	LCN
1	Kick Plate	K0064 12" x 1½" LDW torx	630	TR
1	Armor Plate	AR064 36" x 1½" LDW torx	630	RO

1	Threshold	234 & 280A ssms/ea	AL	RE
1	Door Sweeps	353A	AL	NA
1	Weather Seals	807A	AL	RE
1	Drip Cap	R199A	AL	RE

Hdwe. Set: 29		Roll Up Counter Do		
Door: 102A.2				
To have				
Qty	Description	Manufacturer Model	Fin.	Man.
1	Cylinder & Core	As Required		BE

Hdwe. Set: 30		Roll Up Counter Do		
Door: Attic Stock				
To have				
Qty	Description	Manufacturer Model	Fin.	Man.
20	I/C Cores	Suitable for keying to PPR existing system	626	BE
2	Exit Device	CD-25-511L SUT	630	FA
4	Door Closer	4211 CUSH 4210-30/4210-61	AL	LCN
2	Classroom Lockset	45H7R14R	630	BE
2	Storeroom Lockset	45H7D14R	630	BE
2	Door Sweep	353A	AL	RE
2	Gasketing	BlazeSeal (3'-0" x 7'-0" door)	BLK	RE

END OF SECTION

SECTION 088000 - GLAZING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Glass for windows, doors, interior borrowed lites, curtainwall systems, and storefront framing.
 - 2. Glazing sealants and accessories.

1.2 COORDINATION

- A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.3 ACTION SUBMITTALS

- A. Sustainable Design Submittals: Provide Sustainable Design Submittals in Accordance with Section 018113.
 - 1. Building Product Disclosure Requirements: To encourage the use of building products that are working to minimize their environmental and health impacts, provide the following information when available:
 - a. Environmental Product Declaration: Submit with Product-specific Type III or Industry-wide Type III Environmental Product Declaration (EPD).
 - 2. Recycled Content: The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.
 - 3. Regional Materials: Materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles (160 km) of Project Site. If only a fraction of a product or material is extracted/harvested/recovered and manufactured locally, then only that percentage (by weight) shall contribute to the regional value.
- B. Product Data: For each type of product.
- C. Glass Samples: For each type of the following products; 12 inches (300 mm) square.
 - 1. Coated glass.
 - 2. Laminated glass.
 - 3. Insulating glass.
- D. Glazing Accessory Samples: For gaskets, sealants and colored spacers, in 12-inch (300-mm) lengths.
- E. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.
- F. Delegated-Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer, manufacturers of insulating-glass units with sputter-coated, low-E coatings, glass testing agency and sealant testing agency.
- B. Product Certificates: For glass.
- C. Product Test Reports: For coated glass, insulating glass and glazing sealants, for tests performed by a qualified testing agency.
 - 1. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.
- D. Preconstruction adhesion and compatibility test report.
- E. Sample Warranties: For special warranties.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved by coated-glass manufacturer.
- B. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.
- C. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.
- D. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.
- E. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for materials and execution.

1.6 PRECONSTRUCTION TESTING

- A. Preconstruction Adhesion and Compatibility Testing: Test each glass product, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.
 - 1. Testing is not required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.
 - 2. Use ASTM C 1087 to determine whether priming and other specific joint-preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.
 - 3. Test no fewer than eight Samples of each type of material, including joint substrates, shims, sealant backings, secondary seals, and miscellaneous materials.
 - 4. Schedule enough time for testing and analyzing results to prevent delaying the Work.
 - 5. For materials failing tests, submit sealant manufacturer's written instructions for corrective measures including the use of specially formulated primers.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

- B. Comply with insulating-glass manufacturer's written instructions for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

- 1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or are below 40 deg F (4.4 deg C).

1.9 WARRANTY

- A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.

- 1. Warranty Period: 10 years from date of Substantial Completion.

- B. Manufacturer's Special Warranty for Laminated Glass: Manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

- 1. Warranty Period: 10 years from date of Substantial Completion.

- C. Manufacturer's Special Warranty for Insulating Glass: Manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

- 1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations for Glass: Obtain from single source from single manufacturer for each glass type.

- 1. Obtain reflective-coated glass from single source from single manufacturer.

- B. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

2.2 PERFORMANCE REQUIREMENTS

- A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following:

defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

- B. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design glazing.
- C. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined according to the IBC and ASTM E 1300.
 - 1. Design Wind Pressures: As indicated on Drawings.
 - 2. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.
- D. Safety Glazing: Where safety glazing is indicated or required by code, provide glazing that complies with 16 CFR 1201, Category II.
- E. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
 - 1. For monolithic-glass lites, properties are based on units with lites 6 mm thick of thickness indicated.
 - 2. For laminated-glass lites, properties are based on products of construction indicated.
 - 3. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
 - 4. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F (W/sq. m x K).
 - 5. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
 - 6. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.3 GLASS PRODUCTS, GENERAL

- A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.
 - 1. GANA Publications: "Laminated Glazing Reference Manual" and "Glazing Manual."
 - 2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
- B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction or manufacturer. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- C. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IgCC.
- D. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than the thickness indicated.
 - 1. Minimum Glass Thickness for Exterior Lites: 6 mm.
- E. Strength: Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass. Where heat-strengthened float glass is indicated, provide heat-

strengthened float glass or fully tempered float glass. Where fully tempered float glass is indicated, provide fully tempered float glass.

2.4 GLASS PRODUCTS

- A. Clear Annealed Float Glass: ASTM C 1036, Type I, Class 1 (clear), Quality-Q3.
- B. Fully Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
 - 1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
- C. Heat-Strengthened Float Glass: ASTM C 1048, Kind HS (heat strengthened), Type I, Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
 - 1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
 - 2. Acid-Etched Glass: Acid-etched glass with decorative pattern etched into glass with hydrofluoric and hydrochloric acids, evenly applied, according to manufacturer's standard process.

2.5 LAMINATED GLASS

- A. Laminated Glass: ASTM C 1172. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.
 - 1. Construction: Laminate glass with ionomeric polymer interlayer except polyvinyl butyral interlayer where laminated glass is fully captured by framing to comply with interlayer manufacturer's written instructions.
 - 2. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
 - 3. Interlayer Color: Clear unless otherwise indicated.

2.6 INSULATING GLASS

- A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190.
 - 1. Sealing System: Dual seal, with manufacturer's standard primary and secondary sealants.
 - 2. Spacer: Manufacturer's warm-edge spacer material and construction with black finish.
 - a. Basis-of-Design: Tremco EnerEdge Warm Edge Spacer or approved equal

2.7 GLASS COATINGS

- A. Glass Coatings, and Frits:
 - 1. The contractor shall submit to the Architect detailed proposals in respect of coatings.
 - 2. Low-E Coatings: Subject to review and approval of mockups by the Architect, acceptable high performance neutral solar control low-E coatings include but are not limited to the following:
 - a. Guardian SNX 62/27.
 - b. Viracon VNE-63.
 - c. Vitro Solarban 70.

3. Coatings/Treatments/Interlayers shall not crack, disintegrate or corrode in any way under the extremes of conditions outlined in the Specification.
4. The Contractor shall advise the Architect prior to commencement of the glass coating, the name of the supplier and applicator, together with the location of the facility where this work shall be carried out.
5. Visual quality control acceptance criteria of the low-E coating shall be consistent with industry guidelines, subject to approval of the Architect.
 - a. Pinholes with diameters in excess of 1/16 inch are not acceptable.
 - b. Scratches no longer than 3 inches in length are acceptable provided that they occur within 3 inches of an edge. Concentrated scratches or abraded areas are not allowed.
 - c. Clusters of pinholes are not acceptable.

2.8 GLAZING SEALANTS

A. General:

1. Compatibility: Compatible with one another and with other materials they contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.

2.9 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:

1. AAMA 804.3 tape, where indicated.
2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:

1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.10 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, with requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

- D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

2.11 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
 - 1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
 - a. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.
- C. Grind smooth and polish exposed glass edges and corners.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:
 - 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
 - 2. Presence and functioning of weep systems.
 - 3. Minimum required face and edge clearances.
 - 4. Effective sealing between joints of glass-framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.
- B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that leave visible marks in the completed Work.

3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

- B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.
 - C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
 - D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
 - E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
 - F. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm).
 - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
 - 2. Provide 1/8-inch (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.
 - G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
 - H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
 - I. Set glass lites with proper orientation so that coatings face exterior or interior as specified.
 - J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
 - K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.
- 3.4 TAPE GLAZING
- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
 - B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
 - C. Cover vertical framing joints by applying tapes to heads and sills first, then to jambs. Cover horizontal framing joints by applying tapes to jambs, then to heads and sills.
 - D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
 - E. Do not remove release paper from tape until right before each glazing unit is installed.
 - F. Apply heel bead of elastomeric sealant.

- G. Center glass lites in openings on setting blocks, and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
- H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 GASKET GLAZING (DRY)

- A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- E. Install gaskets so they protrude past face of glazing stops.

3.6 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.7 CLEANING AND PROTECTION

- A. Immediately after installation remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.
 - 1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.

- C. Remove and replace glass that is damaged during construction period.
- D. Wash glass on both exposed surfaces not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

3.8 GLASS SCHEDULE

- A. Glass Type GL-1: Low E-coated, laminated clear insulating safety glass
 - 1. Reference Section "088853 Security Glazing" for performance criteria
- B. Glass Type GL-2: Low-E-coated, clear insulating glass.
 - 1. Basis-of-Design Product: PPG Industries, Inc.; Solarban 70.
 - 2. Overall Unit Thickness: 1 inch (25 mm).
 - 3. Minimum Thickness of Each Glass Lite: 6 mm.
 - 4. Outdoor Lite: Heat-strengthened float glass unless otherwise indicated; fully tempered for safety glazing.
 - 5. Interspace Content: Argon.
 - 6. Indoor Lite: Heat-strengthened float glass unless otherwise indicated; fully tempered for safety glazing.
 - 7. Low-E Coating: Manufacturer's proprietary magnetic sputter vacuum deposition (MSVD) low-e coating on second surface.
 - 8. Ultraviolet Transmittance: 6 percent.
 - 9. Visible Light Transmittance: 64 percent minimum.
 - 10. Total Solar Energy Transmittance: 25 percent.
 - 11. Outdoor Visible Light Reflectance: 52 percent.
 - 12. Total Solar Energy Reflectance: 12 percent.
 - 13. Winter Nighttime U-Factor: 0.28 maximum.
 - 14. Summer Daytime U-Factor: 0.26 maximum.
 - 15. Shading Coefficient: 0.32.
 - 16. Solar Heat Gain Coefficient: 0.27 maximum
 - 17. Light-to-Solar-Gain Ratio: LSG 2.37.
 - 18. Provide safety glazing for locations indicated or where required by code.
- C. Glass Type GL-3: ¼" clear monolithic interior glass
 - 1. Minimum Thickness: 1/4".
 - 2. Fully Tempered Safety glazing required at all areas.
- D. Glass Type GL-4: 3/8" clear monolithic safety glass
 - 1. Reference Section "088853 Security Glazing" for performance criteria

END OF SECTION

SECTION 088300 - MIRRORS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: The following types of silvered flat glass mirrors:
 - 1. Laminated glass mirrors qualifying as safety glazing.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include mirror elevations, edge details, mirror hardware, and attachment details.
- C. Samples: For each type of the following:
 - 1. Mirrors: 12 inches (300 mm) square, including edge treatment on two adjoining edges.
 - 2. Mirror Trim: 12 inches (300 mm) long.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: For each type of mirror and mirror mastic.
- C. Preconstruction 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.
- D. Sample Warranty: For special warranty.

1.4 CLOSEOUT SUBMITTALS

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

1.5 PRECONSTRUCTION TESTING

- A. Preconstruction Mirror Mastic Compatibility Test: Submit mirror mastic products to mirror manufacturer for testing to determine compatibility of mastic with mirror backing.
 - 1. Testing is not required if data are submitted based on previous testing of mirror mastic products and mirror backing matching those submitted.
 - 2.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect mirrors according to mirror manufacturer's written instructions and as needed to prevent damage to mirrors from moisture, condensation, temperature changes, direct exposure to sun, or other causes.

- B. Comply with mirror manufacturer's written instructions for shipping, storing, and handling mirrors as needed to prevent deterioration of silvering, damage to edges, and abrasion of glass surfaces and applied coatings. Store indoors.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not install mirrors until ambient temperature and humidity conditions are maintained at levels indicated for final occupancy.

1.8 WARRANTY

- A. Special Warranty: Manufacturer agrees to replace mirrors that deteriorate within specified warranty period. Deterioration of mirrors is defined as defects developed from normal use that are not attributed to mirror breakage or to maintaining and cleaning mirrors contrary to manufacturer's written instructions. Defects include discoloration, black spots, and clouding of the silver film.

1. Warranty Period: 5 years from date of Substantial Completion.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Binswanger Glass.
 2. Gardner Glass Products, Inc.
 3. Guardian Industries Corp.
 4. National Glass Industries.
 5. Virginia Mirror Company, Inc.
 6. Walker Glass Co., Ltd.
- B. Source Limitations for Mirrors: Obtain mirrors from single source from single manufacturer.
- C. Source Limitations for Mirror Accessories: Obtain mirror glazing accessories from single source.

2.2 SILVERED FLAT GLASS MIRRORS

- A. Mirrors, General: ASTM C 1503.
- B. Laminated Mirrors: ASTM C 1172, Type II.
 1. Glass for Outer Lite: Annealed float glass, Mirror Glazing Quality, clear.
 2. Nominal Thickness for Outer Lite: 3.0 mm.
 3. Glass for Inner Lite: Annealed float glass; ASTM C 1036, Type I (transparent flat glass), Quality- Q3; Class 1 (clear).
 4. Nominal Thickness for Inner Lite: 3.0 mm.
 5. Interlayer: Mirror manufacturer's standard 0.030-inch- (0.76-mm-) thick, clear polyvinyl-butylal interlayer with a proven record of showing no tendency to delaminate from, or cause damage to, silver coating.

- C. Safety Glazing Products: For film-backed or laminated mirrors, provide products that comply with 16 CFR 1201, Category II.

2.3 MISCELLANEOUS MATERIALS

- A. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- B. Edge Sealer: Coating compatible with glass coating and approved by mirror manufacturer for use in protecting against silver deterioration at mirrored glass edges.
- C. Mirror Mastic: An adhesive setting compound, asbestos-free, produced specifically for setting mirrors and certified by both mirror and mastic manufacturer as compatible with glass coating and substrates on which mirrors will be installed.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Franklin International.
 - b. Laurence, C. R. Co., Inc.
 - c. Liquid Nails Adhesive.
 - d. Palmer Products Corporation.
 - e. Royal Adhesives & Sealants, LLC.

2.4 MIRROR HARDWARE

- A. 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 edges of mirrors in a single piece.
 - 1. Bottom Trim: J-channels formed with front leg and back leg not less than 3/8 and 7/8 inch (9.5 and 22 mm) in height, respectively, and a thickness of not less than 0.04 inch (1.0 mm).
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Andscot Company, Inc.
 - 2) Laurence, C. R. Co., Inc.
 - 3) Stylmark, Inc.
 - 2. Top Trim: J-channels formed with front leg and back leg not less than 5/8 and 1 inch (16 and 25 mm) in height, respectively, and a thickness of not less than 0.04 inch (1.0 mm).
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Andscot Company, Inc.
 - 2) Laurence, C. R. Co., Inc.
 - 3) Stylmark, Inc.
 - 3. Finish: Clear satin anodized.

- 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. Fabricate mirrors in the shop to greatest extent possible.
- B. Fabricate cutouts for notches and holes in mirrors without marring visible surfaces. Locate and size cutouts so they fit closely around penetrations in mirrors.
- C. Mirror Edge Treatment: Flat polished.
 1. Seal edges of mirrors with edge sealer after edge treatment to prevent chemical or atmospheric penetration of glass coating.
 2. Require mirror manufacturer to perform edge treatment and sealing in factory immediately after cutting to final sizes.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, over which mirrors are to be mounted, with Installer present, for compliance with installation tolerances, substrate preparation, and other conditions affecting performance of the Work.
- B. Verify compatibility with and suitability of substrates, including compatibility of existing finishes or primers with mirror mastic.
- C. Proceed with installation only after unsatisfactory conditions have been corrected and surfaces are dry.

3.2 PREPARATION

- A. Comply with mastic manufacturer's written installation instructions for preparation of substrates, including coating substrates with mastic manufacturer's special bond coating where applicable.

3.3 INSTALLATION

- A. General: Install mirrors to comply with mirror manufacturer's written instructions and with referenced GANA publications. Mount mirrors accurately in place in a manner that avoids distorting reflected images.
 1. GANA Publications: "Laminated Glazing Reference Manual," "Glazing Manual" and "Mirrors, Handle with Extreme Care: Tips for the Professional on the Care and Handling of Mirrors."
- B. Provide a minimum airspace of 1/8 inch (3 mm) between back of mirrors and mounting

surface for air circulation between back of mirrors and face of mounting surface.

- C. Install mirrors with mastic and mirror hardware. Attach mirror hardware securely to mounting surfaces with mechanical fasteners installed with anchors or inserts as applicable. Install fasteners so heads do not impose point loads on backs of mirrors.
 - 1. Aluminum J-Channels: Provide setting blocks 1/8 inch (3 mm) thick by 4 inches (100 mm) long at quarter points. To prevent trapping water, provide, between setting blocks, two slotted weeps not less than 1/4 inch (6.4 mm) wide by 3/8 inch (9.5 mm) long at bottom channel.
 - 2. Install mastic as follows:
 - a. Apply barrier coat to mirror backing where approved in writing by manufacturers of mirrors and backing material.
 - b. Apply mastic to comply with mastic manufacturer's written instructions for coverage and to allow air circulation between back of mirrors and face of mounting surface.
 - c. After mastic is applied, align mirrors and press into place while maintaining a minimum airspace of 1/8 inch (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 prevent mirrors from being exposed to moisture from condensation or other sources for continuous periods of time.
- D. Clean exposed surface of mirrors not more than four days before date scheduled for inspections that establish date of Substantial Completion. Clean mirrors as recommended in writing by mirror manufacturer.

END OF SECTION

SECTION 088700 - GLAZING SURFACE FILM

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Privacy glazing surface film applied to locations indicated on drawings

1.2 ACTION SUBMITTALS

- A. Product Data: For each glazing surface film product and accessory.
- B. Samples: For each exposed product and for each color and texture specified.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who certified by film manufacturer for installation of its glazing surface film products.
- B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Construct mockup of typical application of glazing surface film on one window at location as directed by Architect.
 - 2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.4 FIELD CONDITIONS

- A. Compatibility: Ensure that glazing surface films are compatible with materials they will contact, including glass products, seals, and glazing accessories, under conditions of service and application, as demonstrated by film manufacturer based on testing and field experience.
- B. Suitability: Comply with film manufacturer's written instructions for selecting films suitable for applications indicated and for conditions existing at time of installation.

1.5 WARRANTY

- A. Manufacturer's Glazing Film Warranty: Manufacturer's standard form in which glazing surface film manufacturer agrees to replace film that deteriorates within specified warranty period. Deterioration of glazing film is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning film contrary to manufacturer's written instructions. Defects include adhesive failure, cracking, crazing, delaminating, peeling, fading, or discoloring of film.
 - 1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GLAZING SURFACE FILM

- A. Basis-of-Design Product: Subject to compliance with requirements, provide 3M Construction Markets Div. (Scotchint), St. Paul MN; FSARA™.
- B. Glazing Surface Film: Abrasion resistant privacy glazing film formulated for application to interior glass surfaces.

1. Color and Pattern: Translucent privacy film as selected by Architect from manufacturer's full range.
 2. Film Material: Polyester film laminate with abrasion resistant coating on exposed surface.
- C. Auxiliary Products: Provide cleaners, primers, adhesives, sealers, and other products as recommended by glazing film manufacturer and as needed to complete installations indicated.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean glass and other surfaces in contact with glazing surface film immediately before application.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with film manufacturer's instructions and recommendations for preparing surfaces and applying glazing surface film. Use manufacturer's recommended cleaners, applicators, and accessories.
- B. Cut film to size according to manufacturer's specified procedures, using dispenser designed for this purpose. Produce neatly cut, square edges of film.
- C. Install film continuously, with uniform appearance, and with edges placed at consistent distance of 1/16 to 1/8 inch (1.6 to 3.0 mm) from glazing seal.
 1. Apply glazing film free of air bubbles, wrinkles, blisters, and other defects, with edges tightly butted, and with vertical seams plumb, and with no gaps or overlaps. Horizontal seams are not permitted.
- D. Remove and replace damaged film, glass and glazing.
- E. Remove and replace film that is bubbled, delaminated abraded, or damaged beyond normal expected deterioration, including natural causes, accidents, and vandalism, during construction period.

END OF SECTION

SECTION 088853 - SECURITY GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Low-E insulated security glazing for exterior conditions
2. Monolithic security glazing for interior conditions

1.2 COORDINATION

- A. Coordinate glazing channel dimensions to provide necessary bite on security glazing, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.3 ACTION SUBMITTALS

- A. Sustainable Design Submittals: Provide Sustainable Design Submittals in Accordance with Section 018113.

1. Building Product Disclosure Requirements: To encourage the use of building products that are working to minimize their environmental and health impacts, provide the following information when available:
 - a. Environmental Product Declaration: Submit with Product-specific Type III or Industry-wide Type III Environmental Product Declaration (EPD).
 - b. Material Ingredient Reporting: Submit Cradle to Cradle (C2C) certification (v2 Basic or v3 Bronze level), Health Product Declaration (HPD), or Declare product labels.
2. Recycled Content: The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.
3. Regional Materials: Materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles (160 km) of Project Site. If only a fraction of a product or material is extracted/harvested/recovered and manufactured locally, then only that percentage (by weight) shall contribute to the regional value.

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

- C. Security Glazing Samples: For each type of security glazing; 12 inches square.

1.4 WARRANTY

- A. Manufacturer's Special Warranty for Laminated Security Glass: Manufacturer's standard form in which laminated-glass manufacturer agrees to replace laminated glass that deteriorates within specified warranty period. Deterioration is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation and delamination due to defects in material workmanship.

1. Warranty Period: 5 years from date of Manufacture.

- B. Manufacturer's Special Warranty for Insulating Glass: Manufacturer's standard form in which insulating-glass manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

- 1. Warranty Period: 5 years from date of Manufacture.

PART 2 – PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II

2.2 SECURITY GLAZING, GENERAL

- A. Glazing Publications: Comply with published recommendations of security glazing and glazing material manufacturers and organizations below unless stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

- 1. GANA Publications: "Laminated Glazing Reference Manual" and "Glazing Manual."

- B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction or manufacturer. Label shall indicate manufacturer's name, type of glazing, glass thickness, and safety glazing standard with which glazing complies.

2.3 GLASS PRODUCTS

- A. Float Glass: ASTM C1036, Type I, Quality-Q3, Class I (clear) unless otherwise indicated.
- B. Heat-Treated Float Glass: ASTM C1048; Type I; Quality-Q3; Class I (clear) unless otherwise indicated; of kind and condition indicated.

2.4 LAMINATED GLASS

- A. Laminated Glass: ASTM C1172. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.
 - 1. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
 - 2. Interlayer Color: Clear unless otherwise indicated.

2.5 SECURITY GLAZING

- A. Polycarbonate Sheet: ASTM C1349, Appendix X1, Type II, coated, mar-resistant, UV- stabilized polycarbonate with coating on exposed surfaces and Type I, standard, UV-stabilized polycarbonate where no surfaces are exposed.
- B. Laminated Polycarbonate: Polycarbonate sheets laminated with clear urethane interlayer that complies with ASTM C1349, Appendix X2, and has a proven record of no tendency to bubble, discolor, or lose

physical and mechanical properties after fabrication and installation. Provide laminated units that comply with requirements of ASTM C1349 for maximum allowable laminating process blemishes and haze.

- C. Glass-Clad Polycarbonate: ASTM C1349.

2.6 GLAZING SEALANTS

A. General:

1. **Compatibility:** Provide glazing sealants that are compatible with one another and with other materials they contact, including security glazing, seals of insulating security glazing and air-gap security glazing, 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 security glazing manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
3. Sealant shall have a VOC content of 250 g/L or less.
4. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
5. **Colors of Exposed Glazing Sealants:** As selected by Architect from manufacturer's full range.

2.7 MISCELLANEOUS GLAZING MATERIALS

- A. **Cleaners, Primers, and Sealers:** Types recommended by sealant or gasket manufacturer.
- B. **Setting Blocks:** Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- C. **Spacers:** Elastomeric blocks or continuous extrusions of hardness required by security glazing manufacturer to maintain security glazing lites in place for installation indicated.
- D. **Edge Blocks:** Elastomeric material of hardness needed to limit security glazing lateral movement (side walking).
- E. **Cylindrical Glazing Sealant Backing:** ASTM C1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

2.8 FABRICATION OF SECURITY GLAZING

- A. **Fabricate security glazing** in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

PART 3 - EXECUTION

3.1 GLAZING, GENERAL

- A. **Basis-of-Design:** Childgard Security Glazing by Isoclima Specialty Glass, LLC to meet ASTM F1233 Class 1.3 and/or 5-aa1 for a minimum of 6 minutes of Forced Entry Resistance. Substitutions must provide

third party test report indicating compliance with this testing criteria.

- B. Comply with combined written instructions of manufacturers of security glazing, sealants, gaskets, and other glazing materials unless more stringent requirements are indicated, including those in referenced glazing publications.
- C. Protect edges of security glazing from damage during handling and installation. Remove damaged security glazing from Project site and legally dispose of off Project site. Damaged security glazing includes units with edge or face damage or other imperfections that, when installed, could weaken security glazing and impair performance and appearance.
- D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications unless otherwise required by glazing unit manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- F. Do not exceed edge pressures stipulated by security glazing manufacturers for installing lites.
- G. Provide spacers for security glazing lites where the length plus width is larger than 50 inches.
- H. Provide edge blocking where indicated or needed to prevent security glazing from moving sideways in glazing channel, as recommended in writing by security glazing manufacturer and according to requirements in referenced glazing publications.

3.2 GASKET GLAZING (DRY)

- A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket securely in place between glazing unit and frame or fixed stop, so it is securely in place with joints miter cut and bonded together at corners.
- C. Installation with Drive-in Wedge Gaskets: Center security glazing 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 security glazing. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. Installation with Pressure-Glazing Stops: Center security glazing in openings on setting blocks and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in security glazing. Seal gasket joints with sealant recommended by gasket manufacturer.
- E. Install gaskets so they protrude past face of glazing stops.

3.3 CLEANING AND PROTECTION

- A. Immediately after installation remove nonpermanent labels and clean surfaces.

- B. Protect security glazing from contact with contaminating substances resulting from construction operations, including weld splatter.

- 1. If, despite such protection, contaminating substances do come into contact with security glazing, remove substances immediately as recommended in writing by security glazing manufacturer. Remove and replace security glazing that cannot be cleaned without damage.

3.4 GLAZING SCHEDULE

- A. GL-1: Insulated Security Glazing

- 1. Basis-of-Design: Single Source Insulating Glass with Childgard Security Glazing by Certified Fabricator of Guardian Glass, or Global Security Glazing
 - 2. Overall Unit Thickness: 1"
 - 2. Exterior Pane: 1/4" [HS or FT] glass, with Solarban 70 Low-E coating on the No. 2 surface
 - 3. Airspace: Argon filled, 3/8" Black LPD Aluminum Spacer
 - 4. Interior Pane: Childgard Security Glazing by Isoclima Specialty Glass, LLC or Global Security Glazing
 - a. Forced Entry Resistance: ASTM F1233 Class 1.4
 - b. Forced Entry Resistance: 5-aa1 rated for a minimum of 6 minutes
 - c. Glass Color: Crystal Gray
 - 5. U-Factor: 0.28
 - 6. Solar Heat Gain Coefficient: 0.27
 - 7. Shading Coefficient: 0.32
 - 8. Overall Visible Light Transmittance: 13%
 - 9. Provide Certification for Fabrication by Vitro Architectural Glass
 - 10. Provide Test Report for ASTM F1233 Class 1.4 by Third Party Independent Laboratory.
 - 11. Provide Test Report for 5-aa1 by Third Party Independent Laboratory.

- B. GL-4: Monolithic Security Glazing Childgard Security Glazing

- 1. Basis-of-Design: Childgard Security Glazing by Isoclima Specialty Glass, LLC or Global Security Glazing
 - 2. Overall Unit Thickness: 3/8"
 - a. Forced Entry Resistance: ASTM F1233 Class 1.4
 - b. Forced Entry Resistance: 5-aa1 rated for a minimum of 6 minutes
 - c. Glass Color: Clear
 - 2. U-Factor: .92
 - 3. Solar Heat Gain Coefficient: .74
 - 4. Overall Visible Light Transmittance: .83
 - 5. Provide Test Report for ASTM F1233 Class 1.4 by Third Party Independent Laboratory.
 - 6. Provide Test Report for 5-aa1 by Third Party Independent Laboratory.
 - 7. Refer To Manufacturers Installation Instructions

END OF SECTION

SECTION 089100 - FIXED LOUVERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Fixed galvanized steel stationary louvers

1.2 ACTION SUBMITTALS

- A. Sustainable Design Submittals: Provide Sustainable Design Submittals in Accordance with Section 018113.
 - 1. Building Product Disclosure Requirements: To encourage the use of building products that are working to minimize their environmental and health impacts, provide the following information when available:
 - a. Environmental Product Declaration: Submit with Product-specific Type III or Industry-wide Type III Environmental Product Declaration (EPD).
 - 2. Recycled Content: The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.
 - 3. Regional Materials: Materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles (160 km) of Project Site. If only a fraction of a product or material is extracted/harvested/recovered and manufactured locally, then only that percentage (by weight) shall contribute to the regional value.
- B. Product Data: For each product to be used, including:
 - 1. Manufacturer's product data including performance data.
 - 2. Preparation instructions and recommendations.
 - 3. Storage and handling requirements and recommendations.
 - 4. Installation methods.
- C. Shop Drawings:
 - 1. Submit shop drawings indicating materials, construction, dimensions, accessories, and installation details.
- D. Samples: For each type of metal finish required

1.3 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each type of louver, for tests performed by a qualified testing agency.
- B. Sample Warranties: For manufacturer's warranties.

1.4 QUALITY ASSURANCE

- A. Product Qualifications:

1. Louvers tested to AMCA 500 L Standards. Ratings based on tests and procedures performed in accordance with AMCA 511.
2. Louvers shall be factory engineered to withstand the specified seismic loads.
 - a. Minimum design loads shall be calculated to comply with ASCE – 7, or local requirements of Authority Having Jurisdiction (AHJ).

1.5 WARRANTY

- A. Special Finish Warranty: Manufacturer agrees to repair or replace components on which finishes fail in materials or workmanship within specified warranty period.
 1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 FORMED GALVANIZED STEEL STATIONARY BLADE LOUVER

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Ruskin Company Model: L330 or comparable products by one of the following:
 1. Aiolite Company, LLC (The).
 2. Construction Specialties, Inc.
 3. Greenheck Fan Corporation.
 4. Industrial Louvers Inc.
 5. Louvers & Dampers, Inc.; a division of Mestek, Inc.
 6. Pottorff.
- B. Louver Depth: 4 inches (100 mm).
- C. Frame and Blade Nominal Thickness: Not less than 18 gage (3.2 mm).
- D. Mullion Type: Fully recessed.
- E. Louver Performance Ratings:
 1. Free Area: Not less than 8.00 sq. ft. for 48-inch- (1220-mm-) wide by 48-inch- (1220-mm-) high louver; 50 percent free area.
 2. Point of Beginning Water Penetration: Not less than 873 fpm.
 3. Air Performance: Not more than 0.10-inch wg (37-Pa) static pressure drop at 674-fpm free-area intake velocity.

2.2 ACCESSORIES

- A. Blank-Off Panels: 20 gage (1 mm) galvanized steel sheet, factory installed with removable fasteners and neoprene gaskets.
- B. Security Bars:
 1. Location: Front.
 2. Construction: Galvanized steel, 1/2 inch x 1/2 inch (13 mm x 13 mm), attached to louver with tamper-proof screws.
 3. Construction: Galvanized steel, 3/4 inch x 1/2 inch (19 mm x 13 mm), attached to louver with tamper-proof screws.

- C. Extended Sills:
 - 1. Galvanized steel, 20 gage (1 mm).

2.3 FINISHES

- A. Finish: 70 percent PVDF: Finish shall be applied at 1.2 mil total dry film thickness.
 - 1. Coating shall conform to AAMA 2605. Apply coating following cleaning and pretreatment. Cleaning: AA-C12C42R1X.
 - a. Standard 2-coat.
 - b. Color and Gloss: As selected from manufacturer's full range

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Inspect areas to receive louvers. Notify the Architect of conditions that would adversely affect the installation or subsequent utilization of the louvers. Do not proceed with installation until unsatisfactory conditions are corrected.
- B. If opening preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Clean opening thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

- A. Install louvers at locations indicated on the drawings and in accordance with manufacturer's instructions.
- B. Install louvers plumb, level, in plane of wall, and in alignment with adjacent work.
- C. Install joint sealants as specified in Section 07 9200.

3.4 CLEANING

- A. Clean louver surfaces in accordance with manufacturer's instructions.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 090164 - WOOD FLOOR REFURBISHING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Refurbishing existing wood flooring, including the following:
 - 1. Removing damaged sections of flooring and providing new replacement flooring.
 - 2. Anchoring loose flooring.
 - 3. Refinishing existing wood floors, including sanding and applying floor finish.
 - 4. Infilling areas with new matching wood flooring.
- B. Related Requirements:
 - 1. Section 015000 "Temporary Facilities and Controls" for temporary heating and other services to protect and maintain existing wood flooring.

1.2 ACTION SUBMITTALS

- A. Sustainable Design Submittals: Provide Sustainable Design Submittals in Accordance with Section 018113.
 - 1. General Emissions Evaluation: Adhesives and Sealants must be tested and determined compliant in accordance with California Department of Public Health (CDPH) Standard Method v1.2-2017, using the applicable exposure scenario. Show compliance with VOC limits as detailed in Section 01 8113 "VOC Limits". VOC Content Requirement for Wet Applied Products: All adhesives and sealants wet-applied on site must meet the applicable VOC limits of the South Coast Air Quality Management District (SCAQMD) Rule 1168, effective October 6, 2017.
- B. Product Data: For each type of product indicated.
- C. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors and finishes available for the following:
 - 1. Floor finishes.
- D. Samples for Verification: For wood flooring, 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.

1.3 QUALITY ASSURANCE

- A. Mockups: To set quality standards for sanding and application of field finishes, prepare finish mockup of floor area approximately 96 by 96 inches (2400 by 2400 mm) in size.
 - 1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. 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.
- B. Store wood flooring materials in a dry, warm, ventilated, weathertight location.

1.5 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.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Wood for Flooring Repairs: Provide kiln-dried wood flooring matching species, grade, cut, face width, thickness and lengths of existing flooring.
- B. Fasteners: As recommended by manufacturer, but not less than that recommended in NWFA's "Installation Guidelines: Wood Flooring."
- C. Urethane Finish System: Complete water-based system of compatible components that is recommended by finish manufacturer for application indicated.
 - 1. Basis-of-Design Products: Subject to compliance with requirements, provide the following products by Bona US (bona.com):
 - a. Floor Sealer: Bona Sport® Sealer.
 - b. Floor Finish: Bona SuperSport® HD.
 - 2. Stain: Penetrating and nonfading type.
 - a. Color: As selected by Architect from manufacturer's full range.
 - 3. Floor Sealer: Pliable, penetrating type.
 - 4. Finish Coats: High-build urethane finish formulated for multicoat application on wood flooring.
- D. Wood Filler: Compatible with finish system components and recommended by filler and finish manufacturers for use indicated. If required to match approved Samples, provide pigmented filler.

PART 3 - EXECUTION

3.1 REFURBISHING EXISTING WOOD FLOORING

- A. Comply with applicable recommendations in NWFA's "Installation Guidelines: Wood Flooring."
- B. Carefully remove wood flooring pieces for replacement without damaging adjacent flooring.

- C. Install new pieces and secure in place so there will be no evidence of repair after refinishing operations.
- D. Anchor loose pieces of existing flooring using same fastening method used for original installation, unless otherwise acceptable to Architect.

3.2 INFILLING WOOD FLOORING

- A. Install and finish wood flooring materials to blend with appearance of existing wood flooring.
 - 1. Select and arrange wood flooring materials to produce a uniform blend of color range, pattern, and other characteristics so new materials are indistinguishable from existing wood flooring in the completed Work.

3.3 SANDING AND FINISHING

- A. Machine-sand flooring to remove offsets, ridges, cups, and sanding-machine marks that would be noticeable after finishing. Vacuum and tack with a clean cloth immediately before applying finish.
 - 1. Comply with floor finish manufacturer's guidelines using MFMA-accepted methods and applicable recommendations in NWFA's "Installation Guidelines: Wood Flooring."
 - 2. Apply no fewer than two coats of floor sealer and two coats of floor finish.
- B. Fill and repair wood flooring seams and defects.
- C. Apply floor-finish materials in number of coats recommended by finish manufacturer for application indicated, but not less than one coat of floor sealer and three finish coats.
 - 1. Apply stains to achieve an even color distribution matching approved Samples.
 - 2. For water-based finishes, use finishing methods recommended by finish manufacturer to minimize grain raise.
- D. Cover wood flooring before finishing.
- E. Do not cover wood flooring after finishing until finish reaches full cure, and not before seven days after applying last finish coat.

3.4 PROTECTION

- A. Protect restored 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.
 - 1. 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 092118 - GYPSUM BOARD SHAFT WALL ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Gypsum board shaft wall assemblies.

1.2 ACTION SUBMITTALS

- A. Sustainable Design Submittals: Provide Sustainable Design Submittals in Accordance with Section 018113.
 - 1. Building Product Disclosure Requirements: To encourage the use of building products that are working to minimize their environmental and health impacts, provide the following information when available:
 - a. Environmental Product Declaration: Submit with Product-specific Type III or Industry-wide Type III Environmental Product Declaration (EPD).
 - b. Material Ingredient Reporting: Submit Cradle to Cradle (C2C) certification (v2 Basic or v3 Bronze level), Health Product Declaration (HPD), or Declare product labels.
 - 2. Recycled Content: The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.
 - 3. Regional Materials: Materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles (160 km) of Project Site. If only a fraction of a product or material is extracted/harvested/recovered and manufactured locally, then only that percentage (by weight) shall contribute to the regional value.
- B. Product Data: For each component of gypsum board shaft wall assembly.

1.3 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For shaft wall assemblies, from ICC-ES.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.5 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or with gypsum board manufacturer's written recommendations, whichever are more stringent.
- B. Do not install interior products until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, moisture damaged, or mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: Provide materials and construction identical to those of assemblies tested according to ASTM E 90 and classified according to ASTM E 413 by a testing and inspecting agency.

2.2 GYPSUM BOARD SHAFT WALL ASSEMBLIES

- A. Fire-Resistance Rating: As indicated.
- B. STC Rating: As indicated.
- C. Studs: Manufacturer's standard profile for repetitive members, corner and end members, and fire-resistance-rated assembly indicated.
 1. Depth: As indicated.
 2. Minimum Base-Metal Thickness: As indicated.
- D. Runner Tracks: Manufacturer's standard J-profile track with manufacturer's standard long-leg length, but at least 2 inches (51 mm) long and matching studs in depth.
 1. Minimum Base-Metal Thickness: Matching steel studs.
- E. Firestop Tracks: Provide firestop track at head of shaft wall on each floor level.
- F. Elevator Hoistway Entrances: Manufacturer's standard J-profile jamb strut with long-leg length of 3 inches (76 mm), matching studs in depth, and not less than 0.033 inch (0.84 mm) thick.
- G. Room-Side Finish: Gypsum board, unless otherwise indicated.
- H. Shaft-Side Finish: Gypsum shaftliner board, Type X.
- I. Insulation: Sound attenuation blankets.

2.3 PANEL PRODUCTS

- A. Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.
- B. Gypsum Shaftliner Board, Moisture and Mold-Resistant Type X: ASTM C 1396/C 1396M; manufacturer's proprietary fire-resistive liner panels with paper faces.

1. Products: Subject to compliance with requirements, provide products by one of the following:
 - a. CertainTeed Corporation.;
 - b. Georgia-Pacific Building Products.;
 - c. National Gypsum Company;
 - d. USG Corporation;
2. Thickness: 1 inch (25.4 mm).
3. Long Edges: Double bevel.

C. Gypsum Board: As specified in Section 092900 "Gypsum Board."

2.4 NON-LOAD-BEARING STEEL FRAMING

- A. Steel Framing Members: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
1. Protective Coating: Coating with equivalent corrosion resistance of ASTM A 653/A 653M, G40 (Z120) unless otherwise indicated.
- B. 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 not less than indicated for studs and in width to accommodate depth of studs.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Fire Trak Corp.
 - b. GCP Applied Technologies Inc. (formerly Grace Construction Products).
 - c. Metal-Lite.
 - d. The Steel Network, Inc.

2.5 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with manufacturer's written recommendations.
- B. Trim Accessories: Cornerbead, edge trim, and control joints of material and shapes as specified in Section 092900 "Gypsum Board" that comply with gypsum board shaft wall assembly manufacturer's written recommendations for application indicated.
- C. Steel Drill Screws: ASTM C 1002 unless otherwise indicated.
- D. Track 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.
1. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing according to ASTM E 488 conducted by a qualified testing agency.
 2. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing according to ASTM E 1190 conducted by a qualified testing agency.

- E. Sound Attenuation Blankets: As specified in Section 098116 "Acoustical Blanket Insulation."
- F. Acoustical Sealant: As specified in Section 079219 "Acoustical Joint Sealants."

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.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, or mold damaged.
- C. 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 ASTM C 754 other than stud-spacing requirements.
- B. Do not bridge building expansion joints with shaft wall assemblies; frame both sides of expansion 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, wall-mounted door stops, and similar items that cannot be supported directly by shaft wall assembly framing.
 - 1. Elevator Hoistway: At elevator hoistway-entrance door frames, provide jamb struts on each side of door frame.
 - 2. Reinforcing: Where handrails directly attach to gypsum board shaft wall assemblies, provide galvanized steel reinforcing strip with [0.033-inch (0.84-mm)] <Insert dimension> minimum thickness of base metal (uncoated), accurately positioned and secured behind at least one layer of face panel.
- D. Penetrations: 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.
- E. Isolate perimeter of gypsum panels from building structure to prevent cracking of panels, while maintaining continuity of fire-rated construction.
- F. Firestop Tracks: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
- G. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect while maintaining fire-resistance rating of gypsum board shaft wall assemblies.
- H. Sound-Rated Shaft Wall Assemblies: 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.

- I. Cant Panels: At projections into shaft exceeding 4 inches (102 mm), install 1/2- or 5/8-inch- (13- or 16-mm-) 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 (610 mm) 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 (610 mm) o.c. and extend studs from the projection to shaft wall framing.
- J. 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.

3.3 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, or mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and 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 092216 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Non-load-bearing steel framing systems for interior partitions.
 - 2. Suspension systems for interior ceilings and soffits.

1.3 ACTION SUBMITTALS

- A. Sustainable Design Submittals: Provide Sustainable Design Submittals in Accordance with Section 018113.
 - 1. Building Product Disclosure Requirements: To encourage the use of building products that are working to minimize their environmental and health impacts, provide the following information when available:
 - a. Environmental Product Declaration: Submit with Product-specific Type III or Industry-wide Type III Environmental Product Declaration (EPD).
 - 2. Recycled Content: The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.
 - 3. Regional Materials: Materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles (160 km) of Project Site. If only a fraction of a product or material is extracted/harvested/recovered and manufactured locally, then only that percentage (by weight) shall contribute to the regional value.
- B. Product Data: For each type of product.
 - 1. Studs and Runners: Provide documentation that framing members' certification is according to SIFA's "Code Compliance Certification Program for Cold-Formed Steel Structural and Non-Structural Framing Members."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- 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.

2.2 FRAMING SYSTEMS

- A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.

- 1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
- 2. Protective Coating: ASTM A 653/A 653M, G40 (Z120), hot-dip galvanized unless otherwise indicated.

- B. Studs and Runners: ASTM C 645. Use either steel studs and runners or embossed steel studs and runners.

- 1. Steel Studs and Runners:

- a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- 1) CEMCO; California Expanded Metal Products Co.
- 2) MBA Building Supplies.
- 3) MRI Steel Framing, LLC.
- 4) Phillips Manufacturing Co.
- 5) Steel Network, Inc. (The).
- 6) Telling Industries

- b. Minimum Base-Metal Thickness: 0.0296 inch (0.752 mm), 20 gauge.

- c. Depth: As indicated on Drawings.

- 2. Embossed Steel Studs and Runners:

- a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- 1) CEMCO; California Expanded Metal Products Co.
- 2) ClarkDietrich Building Systems.
- 3) Marino\Ware.
- 4) MBA Building Supplies.
- 5) Phillips Manufacturing Co.
- 6) Steel Network, Inc. (The).
- 7) Telling Industries.

- b. Minimum Base-Metal Thickness: 0.0296 inch, unless otherwise indicated.

- c. Depth: As indicated on drawings.

- C. Slip-Type Head Joints: Where indicated, provide one of the following:

- 1. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.

- a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) BlazeFrame Industries.
 - 2) CEMCO; California Expanded Metal Products Co.
 - 3) ClarkDietrich Building Systems.
 - 4) MBA Building Supplies.
 - 5) Metal-Lite.
 - 6) Steel Network, Inc. (The).
 - 7) Telling Industries.

- D. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. BlazeFrame Industries.
 - b. CEMCO; California Expanded Metal Products Co.
 - c. ClarkDietrich Building Systems.
 - d. Fire Trak Corp.
 - e. Metal-Lite.
 - f. Steel Network, Inc. (The).

- E. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
 - 1. Minimum Base-Metal Thickness: 0.0269 inch.

- F. Cold-Rolled Channel Bridging: Steel, 0.0538-inch minimum base-metal thickness, with minimum 1/2-inch-wide flanges.
 - 1. Depth: 1-1/2 inches, unless otherwise indicated.
 - 2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch-thick, galvanized steel.

- G. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
 - 1. Minimum Base-Metal Thickness: 0.0296 inch.
 - 2. Depth: As indicated on Drawings.

- H. Resilient Furring Channels: 1/2-inch-deep, steel sheet members designed to reduce sound transmission.
 - 1. Configuration: Asymmetrical or hat shaped.

- I. Cold-Rolled Furring Channels: 0.053-inch uncoated-steel thickness, with minimum 1/2-inch-wide flanges.
 - 1. Depth: 3/4 inch.
 - 2. Furring Brackets: Adjustable, corrugated-edge-type steel sheet with minimum uncoated-steel thickness of 0.0329 inch.
 - 3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch-diameter wire, or double strand of 0.048-inch-diameter wire.

2.3 SUSPENSION SYSTEMS

- A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch-diameter wire, or double strand of 0.048-inch-diameter wire.
- B. Hanger Attachments to Concrete:
 - 1. Expansion Anchors: Fabricated from corrosion-resistant materials, with allowable load or strength design capacities calculated according to ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing per ASTM E 488/E 488M conducted by a qualified testing agency.
 - 2. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.
- C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch in diameter.
- D. Flat Hangers: Steel sheet, 1 by 3/16 inch by length indicated.
- E. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.0538 inch and minimum 1/2-inch-wide flanges.
 - 1. Depth: 2-1/2 inches (64 mm).
- F. Furring Channels (Furring Members):
 - 1. Cold-Rolled Channels: 0.0538-inch uncoated-steel thickness, with minimum 1/2-inch- (13-mm-) wide flanges, 3/4 inch deep.
 - 2. Steel Studs and Runners: ASTM C 645.
 - a. Minimum Base-Metal Thickness: 0.0269 inch.
 - b. Depth: 3-5/8 inches, unless otherwise indicated.
 - 3. Embossed Steel Studs and Runners: ASTM C 645.
 - a. Minimum Base-Metal Thickness: 0.0190 inch.
 - b. Depth: 3-5/8 inches, unless otherwise indicated.
 - 4. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch deep.
 - a. Minimum Base-Metal Thickness: 0.0296 inch.

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 of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.
 - 1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

3.3 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C 754.
- B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.
- C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction
- D. Install bracing at termination in assemblies.
- E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING FRAMED ASSEMBLIES

- A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
- B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- C. Where indicated on drawings provide acoustical isolation pads. Install according to manufacturer requirements.
- D. Install studs so flanges within framing system point in same direction.
- E. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts that penetrate partitions above ceiling.
 - 1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.

2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
 - a. Install two studs at each jamb unless otherwise indicated.
 - b. If control joints are indicated or required at heads of doors, install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
 - c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
 3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
 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.
- F. Direct Furring:
1. Screw to wood framing.
 2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
- G. 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.

3.5 INSTALLING SUSPENSION SYSTEMS

- A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
1. Hangers: 48 inches o.c.
 2. Carrying Channels (Main Runners): 48 inches o.c.
 3. Furring Channels (Furring Members): 16 inches o.c.
- 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, counterplaying, or other equally effective means.

2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
 - a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
 3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 5. Do not attach hangers to steel roof deck.
 6. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
 7. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
 8. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.
- E. Installation Tolerances: Install suspension systems that are level to within [1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION

SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior gypsum board for walls and ceilings.
2. Tile backing panels.

B. Related Requirements:

1. Section 061600 "Sheathing" for gypsum sheathing for exterior walls
2. Section 092116 "Gypsum Board Shaft Wall Assemblies" for metal shaft-wall framing, gypsum shaft liners, and other components of shaft-wall assemblies
3. Section 079200 "Joint Sealants" for acoustical joint sealants installed in gypsum board assemblies.
4. Section 092216 "Non-Structural Metal Framing" for non-structural steel framing and suspension systems that support gypsum board panels.
5. Section 093013 "Tiling" for cementitious backer units installed as substrates for ceramic tile

1.2 ACTION SUBMITTALS

A. Sustainable Design Submittals: Provide Sustainable Design Submittals in Accordance with Section 018113.

1. Building Product Disclosure Requirements: To encourage the use of building products that are working to minimize their environmental and health impacts, provide the following information when available:
 - a. Environmental Product Declaration: Submit with Product-specific Type III or Industry-wide Type III Environmental Product Declaration (EPD).
 - b. Material Ingredient Reporting: Submit Cradle to Cradle (C2C) certification (v2 Basic or v3 Bronze level), Health Product Declaration (HPD), or Declare product labels.
2. Recycled Content: The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.
3. Regional Materials: Materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles (160 km) of Project Site. If only a fraction of a product or material is extracted/harvested/recovered and manufactured locally, then only that percentage (by weight) shall contribute to the regional value.

B. Product Data: For each type of product.

1.3 QUALITY ASSURANCE

A. Mockups: Build mockups of at least 100 sq. ft. in surface area to demonstrate aesthetic effects and to set quality standards for materials and execution.

1. Build mockups for each level of gypsum board finish indicated for use in exposed locations.

2. Simulate finished lighting conditions for review of mockups.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.5 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written instructions, whichever are more stringent.
- B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, moisture damaged, and mold damaged.
 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.
- C. Environmental Certification: Provide materials carrying certification by one of the following:
 1. Greenguard Gold Certification

2.2 GYPSUM BOARD, GENERAL

- A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

- A. Gypsum Board, Type X: ASTM C 1396/C 1396M.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. CertainTeed Corporation.

- b. National Gypsum Company.
 - c. USG.
 - 2. Thickness: 5/8 inch.
 - 3. Long Edges: Tapered.
- B. Abuse-Resistant Gypsum Board: ASTM C 1396/C 1396M gypsum board, tested according to ASTM C 1629/C 1629M.
- 1. Products: Subject to compliance with requirements, provide products by one of the following:
 - a. American Gypsum; M-Bloc AR Type X Wallboard.
 - b. CertainTeed Corporation; ProRoc Abuse Resistant.
 - c. Georgia-Pacific Building Products; ToughRock Abuse-Resistant Gypsum Board
 - d. National Gypsum Company; Hi-Abuse Brand XP Fire-Shield Wallboard.
 - e. USG; FIBEROCK Brand Abuse-Resistant Gypsum Fiber Panel.
 - 2. Core: 5/8 inch, Type X.
 - 3. Surface Abrasion: ASTM C 1629/C 1629M, meets or exceeds Level 1 requirements.
 - 4. Indentation: ASTM C 1629/C 1629M, meets or exceeds Level 1 requirements.
 - 5. Soft-Body Impact: ASTM C 1629/C 1629M, meets or exceeds Level 2 requirements.
 - 6. Long Edges: Tapered.
 - 7. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
- C. Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces.
- 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. American Gypsum; M-Bloc® Shaft Liner with Mold & Moisture Resistance.
 - b. CertainTeed Corporation; ProRoc Moisture and Mold Resistant Gypsum Board with M2Tech.
 - c. National Gypsum Company; Gold Bond Brand XP Wallboard.
 - d. USG; SHEETROCK Brand Mold Tough or FIBEROCK Brand, Aqua Tough Interior Panels.
 - 2. Core: 5/8 inch, Type X.
 - 3. Long Edges: Tapered.
 - 4. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.4 TRIM ACCESSORIES

- A. Composite Interior Trim:
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Certainteed, No-Coat Corner Bead
 - b. Clark Dietrich – Pro-90 Corner Bead
 - c. Trimtex – Fast Edge
 - 2. Material: Structural Laminate
 - 3. Shapes:

- a. Cornerbead.
 - b. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - c. L-Bead: L-shaped; exposed long flange receives joint compound.
 - B. Vinyl Trim: Extruded accessories of profiles and dimensions indicated.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Trim-Tex Drywall Products
 - b. Shapes: Architectural Reveal Bead
 - C. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Fry Reglet Corporation.
 - b. Gordon, Inc.
 - c. Pittcon Industries.
 - 2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221, Alloy 6063-T5.
 - 3. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified.
- 2.5 TILE BACKING PANELS
- A. Cementitious Backer Units: ANSI A118.9 and ASTM C 1288 or 1325 with manufacturer's standard edges
 - 1. Products: Subject to compliance with requirements, provide products by one of the following:
 - a. CertainTeed Corp: FiberCement Underlayment or Backer Board
 - b. National Gypsum Company, Permabase Cement Board
 - c. USG Corporation: DUROCK Cement Board
 - 2. Thickness: 5/8 inch
 - 3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D3274
- 2.6 JOINT TREATMENT MATERIALS
- A. General: Comply with ASTM C 475/C 475M.
 - B. Joint Tape:
 - 1. Interior Gypsum Board: Paper.
 - C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.
 - 1. Prefilling: At open joints and damaged surface areas, use setting-type taping compound.
 - 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping or drying-type, all-purpose] compound.
 - a. Use setting-type compound for installing paper-faced metal trim accessories.

3. Fill Coat: For second coat, use setting-type, sandable topping or drying-type, all-purpose] compound.
4. Finish Coat: For third coat, use setting-type, sandable topping or drying-type, all-purpose] compound.

2.7 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.
- B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
- C. Steel Drill Screws: ASTM C 1002 unless otherwise indicated.
 1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
 2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- D. Sound-Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
 1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
- E. Acoustical Sealant: As specified in Section 079200 "Joint Sealants"

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
 - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
 - 2. Fit gypsum panels around ducts, pipes, and conduits.
 - 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch-wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch-wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written instructions for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
- J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
 - 1. Type X: As indicated on Drawings.
 - 2. Abuse-Resistant Type: In corridors, gymnasium and Commons.
 - 3. Mold-Resistant Type: Exposed surfaces located in bathroom areas and janitor closets.
- B. Single-Layer Application:
 - 1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
 - 2. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
 - 3. On Z-shaped furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.

4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.
- C. Multilayer Application:
1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
 2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
 3. Fastening Methods: Fasten base layers and face layers separately to supports with screws.
- D. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written instructions and temporarily brace or fasten gypsum panels until fastening adhesive has set.
- ### 3.4 INSTALLATION OF TILE BACKING PANELS
- A. Cementitious Backer Units: ANSI A108.11, at locations indicated to receive tile
- B. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces
- ### 3.5 INSTALLING TRIM ACCESSORIES
- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.
- C. Interior Trim: Install in the following locations:
1. Cornerbead: Use at outside corners unless otherwise indicated.
 2. LC-Bead: Use at exposed panel edges.
 3. L-Bead: Use where indicated.
- D. Aluminum Trim: Install in locations indicated on Drawings.
- ### 3.6 FINISHING GYPSUM BOARD
- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints, rounded or beveled edges, and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

- D. Cementitious Backer Units: Finish according to manufacturer's written instructions.
- E. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
 - 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
 - 2. Level 2: Panels that are substrate for tile.
 - 3. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.
 - a. Primer and its application to surfaces are specified in Section 099000 "Painting and Coatings."

3.7 PROTECTION

- A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION

SECTION 093013 - CERAMIC TILING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Porcelain wall tile.
2. Waterproof membrane.
3. Metal edge strips.

B. Related Requirements:

1. Section 092900 "Gypsum Board" for tile backing units
2. Section 079200 "Joint Sealants" for sealing of expansion, contraction, control and isolation joints in tile surfaces

1.2 ACTION SUBMITTALS

A. Sustainable Design Submittals: Provide Sustainable Design Submittals in Accordance with Section 018113.

1. Building Product Disclosure Requirements: To encourage the use of building products that are working to minimize their environmental and health impacts, provide the following information when available:
 - a. Environmental Product Declaration: Submit with Product-specific Type III or Industry-wide Type III Environmental Product Declaration (EPD).
 - b. Material Ingredient Reporting: Submit Cradle to Cradle (C2C) certification (v2 Basic or v3 Bronze level), Health Product Declaration (HPD), or Declare product labels.
2. Recycled Content: The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.
3. Regional Materials: Materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles (160 km) of Project Site. If only a fraction of a product or material is extracted/harvested/recovered and manufactured locally, then only that percentage (by weight) shall contribute to the regional value.

B. Product Data: For each type of product.

C. Samples:

1. Each type and composition of tile and for each color and finish required.
2. Full-size units of each type of trim and accessory.
3. Stone thresholds in 6-inch (150-mm) lengths.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.

1.5 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Build mockup of each type of floor tile installation.
 - 2. Build mockup of each type of wall tile installation.
 - 3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE

- A. Large-Format Tile Substrate Conditions: Set large-format floor tile only on substrates that comply with tolerances of no more than 1/8-inch variance in 10 ft., and no more than 1/16-inch variation in 24 inches. Use one or more of the following methods to rectify substrates that do not comply with these tolerances, as recommended by manufacturers of tile and setting products:
 - 1. Use medium-bed mortar if Project conditions can accommodate mortar bed thickness.
 - 2. Use thinset mortar with medium-bed features.
 - 3. Prepare substrates with patching and leveling compound or other products recommended by manufacturer.

2.2 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.

2.3 TILE PRODUCTS

- A. Ceramic Tile Type CT-1: Porcelain Wall Tile
 - 1. Product: Daltile Median Series
 - 2. Certification: Tile certified by the Porcelain Tile Certification Agency.
 - 3. Face Size: 11-5/8 by 23-5/8 inches.
 - 4. Thickness: 3/8 inch (9.5 mm).
 - 5. Face: Matte finish
 - 6. Dynamic Coefficient of Friction: Not less than 0.42.
 - 7. Tile Color: Light Grey MN43
 - 8. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile unless otherwise indicated. Provide shapes selected by Architect from manufacturer's standard shapes.

2.4 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. Fabric-Reinforced, Fluid-Applied Membrane: System consisting of liquid-latex rubber or elastomeric polymer and continuous fabric reinforcement.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Bonsal American, an Oldcastle company; B 6000 Waterproof-Crack Isolation Membrane with B 6000 Mesh.
 - b. Laticrete International, Inc.; Laticrete 9235 Waterproof Membrane.
 - c. MAPEI Corporation; Mapelastic 400 or Mapelastic HPG with MAPEI Fiberglass Mesh.

2.5 SETTING MATERIALS

- A. Modified Cement Mortar (Thinset): ANSI A118.4.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Custom Building Products.
 - b. Laticrete International, Inc.
 - c. MAPEI Corporation.
 - d. ARDEX Americas.
 - 2. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.
 - 3. For wall applications, provide nonsagging mortar.

2.6 GROUT MATERIALS

- A. High-Performance Tile Grout: ANSI A118.7.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Custom Building Products.
 - b. Laticrete International, Inc.
 - c. MAPEI Corporation.
 - 2. Polymer Type: Ethylene vinyl acetate or acrylic additive, in dry, redispersible form, prepackaged with other dry ingredients.
- B. Grout Colors: As selected by Architect from manufacturer's full range.

2.7 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

- B. Metal Edge Strips: Stainless-steel strips, height to match tile and setting-bed thickness, designed specifically for wall applications and other conditions indicated; of profiles indicated and to suit conditions, with integral provision for anchorage to substrate and as follows:
 - 1. Basis-of-Design Manufacturer: Schluter Systems L.P., JOLLY
 - 2. Finish: Satin stainless-steel.

- C. Grout Sealer: Manufacturer's standard product for sealing grout joints and that does not change color or appearance of grout.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Bonsal American, an Oldcastle company; Grout Sealer.
 - b. Custom Building Products; AQUA MIX Sealer's Choice Gold.
 - c. Summitville Tiles, Inc.; SL-15, Invisible Seal.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 - 1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
 - 2. Verify that concrete substrates for tile floors installed with thinset mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.

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

3.2 PREPARATION

- A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thinset mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.

- B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot (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. Temporary Protective Coating: If needed to prevent mortar or grout from staining or adhering to exposed tile surfaces, precoat them with continuous film of temporary protective coating recommended by tile manufacturer, taking care not to coat unexposed tile surfaces.

3.3 CERAMIC TILE INSTALLATION

- A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series

"Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.

1. Follow procedures in the ANSI A108 series of tile installation standards for providing 95 percent mortar coverage.
 - B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
 - C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
 - D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.
 - E. Where accent tile differs in thickness from field tile, vary setting-bed thickness so that tiles are flush.
 - F. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
 1. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.
 - G. Joint Widths: Unless otherwise indicated, install tile with joint widths recommended by tile manufacturer and approved by Architect.
 - H. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.
 - I. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
 1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.
 - J. Metal Edge Strips: Install at locations indicated and where exposed edge of tile flooring meets other flooring that finishes flush with or below top of tile and no threshold is indicated.
 - K. Grout Sealer: Apply grout sealer to grout joints 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.
 - L. Install waterproofing to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness that is bonded securely to substrate.
- 3.4 INTERIOR CERAMIC TILE INSTALLATION SCHEDULE
- A. Interior Wall Installations, Metal Studs or Furring:
 1. Ceramic Tile Installation: TCNA W244C or TCNA W244F; thinset mortar on cementitious backer units or fiber-cement backer board.
 - a. Thinset Mortar: Modified dry-set cement mortar.

- b. Grout: High-performance unsanded grout.

END OF SECTION

SECTION 096460 - WOOD ATHLETIC FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included: The Work of this Section includes, but is not limited to the following:

1. Wood athletic flooring.
2. Vapor retarder
3. Plywood subflooring on cushion pads
4. Vent cover wall base
5. Floor finishing

1.2 COORDINATION

- A. Coordinate layout and installation of slab depressions to accommodate layout and height of wood athletic flooring assembly.
- B. Coordinate layout and installation of flooring with floor inserts for gymnasium equipment.

1.3 ACTION SUBMITTALS

- A. Sustainable Design Submittals: Provide Sustainable Design Submittals in Accordance with Section 018113.
1. Building Product Disclosure Requirements: To encourage the use of building products that are working to minimize their environmental and health impacts, provide the following information when available:
 - a. Environmental Product Declaration: Submit with Product-specific Type III or Industry-wide Type III Environmental Product Declaration (EPD).
 - b. Material Ingredient Reporting: Submit Cradle to Cradle (C2C) certification (v2 Basic or v3 Bronze level), Health Product Declaration (HPD), or Declare product labels.
 2. General Emissions Evaluation: Adhesives and Sealants must be tested and determined compliant in accordance with California Department of Public Health (CDPH) Standard Method v1.2-2017, using the applicable exposure scenario.
Show compliance with VOC limits as detailed in Section 01 8113 "VOC Limits".
VOC Content Requirement for Wet Applied Products: All adhesives and sealants wet-applied on site must meet the applicable VOC limits of the South Coast Air Quality Management District (SCAQMD) Rule 1168, effective October 6, 2017.
 3. Recycled Content: The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.
 4. Regional Materials: Materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles (160 km) of Project Site. If only a fraction of a product or material is extracted/harvested/recovered and manufactured locally, then only that percentage (by weight) shall contribute to the regional value.
- B. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for wood athletic flooring.
- C. Shop Drawings: For each type of floor assembly, include the following:
1. Plans, sections, and attachment details.
 2. Details of concrete-slab depressions.
 3. Locations of different grades of wood flooring.
 4. Expansion provisions and trim details.
 5. Layout, colors, widths, and dimensions of game lines and markers.
 6. Locations of floor inserts for athletic equipment installed through flooring assembly.
- D. Samples for Verification: For each type of wood athletic flooring and accessory required; approximately 12 inches 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 and game-line and marker paints applied to wood flooring.
- E. Product Test Reports: For each wood athletic flooring system, for tests performed by a qualified testing agency.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For wood athletic flooring and finish systems to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A firm or individual that has been approved by MFMA as an accredited Installer according to the MFMA Accreditation Program.
1. Installer responsibilities include installation and field finishing of wood athletic flooring components and accessories, and application of game lines and markers.
 2. Company specializing in performing the Work of this Section with a minimum of (5) years experience
- B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for installation.
1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver floor 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 FIELD CONDITIONS

- A. Conditioning period begins not less than seven days before wood athletic flooring installation, is continuous through installation, and continues not less than seven days after installation.
 - 1. Environmental Conditioning: Maintain ambient temperature between 65 and 75 deg F and relative humidity planned for building occupants, but not less than 35 percent or more than 50 percent, in spaces to receive wood athletic flooring 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 wood athletic flooring 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 wood athletic flooring after other finishing operations, including painting, have been completed.

2.1 MANUFACTURERS – ANCHORED FLOOR SYSTEMS

- A. Products: Subject to compliance with the requirements, provide the following or equal as approved by the Architect:
 - 1. Robbins, Inc, While Lake Wisconsin, Bio Cushion Classic

2.2 SYSTEM DESCRIPTION

- A. System Type: Floating
- B. System construction shall include Athletic Response Ridge design providing for (1st) light and (2nd) aggressive athletic load response.
- C. System construction shall include manufactured method of stop blocking throughout entire floor for protective resilient pad housing and full subfloor support under significant non- athletic loads.
- D. Resilient pads shall be linear, aligned continuously perpendicular to flooring direction, average spacing of 8 inch on center.
- E. Closed cell polyethylene foam shall not be included as a resilient component.
- F. Subfloor shall provide full surface plate throughout, manufactured of minimum ¾ inch, 7-ply plywood.
- G. Subfloor panels shall be integrated with attachment of extending edges on all sides.
- H. Installation method of subfloor system shall include special anchorage tool to prevent excessive

compression of resilient components.

2.3 FLOORING MATERIALS

- A. 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.
- B. Random-Length or Finger-Jointed Strip Flooring: Northern hard maple (*Acer saccharum*), kiln dried, tongue and groove, and end matched.
 - 1. Grade: MFMA-RL Second and Better.
 - 2. Cut: Edge or Flat.

2.4 SUBFLOOR MATERIALS

- A. Plywood Underlayment: APA rated, C-D plugged, exterior glue. Pre-manufactured 1/2 inch thick subfloor panels providing machined pad slots, anchor pockets, and attached pads.
- B. Resilient Pads: With air voids for resiliency and installed at manufacturer's standard spacing for product designation indicated above
 - 1. Basis-of-design: Robbins 7/16" EPDM Bio Pad

2.5 FINISHES

- A. Floor-Finish System: System of compatible components recommended in writing by flooring manufacturer, and MFMA approved.
 - 1. Floor-Sealer Formulation: Pliable, penetrating type. MFMA Group 1, Sealers.
 - 2. Finish-Coat Formulation: Formulated for gloss finish indicated and multicoat application.
 - a. Type: MFMA Group 5, Water-Based Finishes.
 - 3. Game-Line and Marker Paint: Industrial enamel compatible with finish coats and recommended in writing by manufacturers of finish coats, and paint for this use.

2.6 ACCESSORIES

- A. Vapor Retarder: ASTM D 4397, polyethylene sheet not less than 6 mils thick.
- B. Resilient Wall Base: Molded, vented, rubber or vinyl cove base; 4 by 3 by 48 inches; with premolded outside corners.
 - 1. Color: Black
- C. Thresholds: As specified in Section 087100 "Door Hardware."
- D. Fasteners: Type and size recommended by manufacturer, but not less than those recommended by MFMA for application indicated.
- E. Gamelines: Gameline paint shall be recommended by the finishing materials manufacturer, and must be compliant with the finish

- F. Trowelable Leveling and Patching Compound: Latex-modified, hydraulic-cement-based formulation approved by wood athletic flooring manufacturer.
- G. Adhesives: Manufacturer's standard for application indicated.

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 the Work.
- 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 1000 sq. ft., and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
 - a. Anhydrous Calcium Chloride Test: ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 4.5 lb of water/1000 sq. ft. in 24 hours.
 - b. Relative Humidity Test: Using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 80 percent relative humidity level measurement.
 - c. Perform additional moisture tests recommended by manufacturer. Proceed with installation only after substrates pass testing.

3.2 PREPARATION

- A. Concrete Slabs:
 - 1. Grind high spots and fill low spots on concrete substrates to produce a maximum 1/8- inch deviation in any direction when checked with a 10-foot straight edge.
 - 2. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, and depressions in substrates.
- B. 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. Comply with wood athletic flooring manufacturer's written instructions, but not less than written recommendations of MFMA applicable to flooring type indicated.
- B. Pattern: Lay flooring parallel with long dimension of space to be floored unless otherwise indicated.
- 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, trim, and saddles, as indicated on Drawings.
- D. Vapor Retarder: Cover entire slab area beneath wood flooring. Install with joints lapped a minimum of 6 inches and sealed.
- E. Strip Flooring: Mechanically fasten perpendicular to supports.
- F. Installation Tolerances: 1/8 inch in 10 feet of variance from level.

3.4 SANDING AND FINISHING

- A. Allow installed flooring to acclimate to ambient conditions before sanding.
- B. Follow applicable recommendations in MFMA's "Industry Recommendations for Sanding, Sealing, Court Lining, Finishing, and Resurfacing of Maple Gym Floors."
- 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 no fewer than four coats total and no fewer than two finish coats.
 1. Water-Based Finishes: Use finishing methods recommended by finish manufacturer to reduce grain raise and side bonding effect.
 2. Game-Line and Marker Paint: Apply game-line and marker paint between final seal coat and first finish coat according to paint manufacturer's written instructions.
 - a. Mask flooring at game lines and markers, and apply paint to produce lines and markers with sharp edges.
 - b. Where game lines cross, break minor game line at intersection; do not overlap lines.
 - c. Apply game lines and markers in widths and colors according to requirements indicated on Drawings.
 - d. Apply finish coats after game-line and marker paint is fully cured.

3.5 PROTECTION

- A. Protect wood athletic flooring 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.
 1. Do not cover flooring after finishing until finish reaches full cure and not before seven days after applying last finish coat.
 2. Do not move heavy and sharp objects directly over flooring. Protect fully cured floor finishes and surfaces with plywood or hardboard panels to prevent damage from storing or moving objects over flooring.

END OF SECTION

SECTION 096513 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Resilient base.
2. Integrated rubber stair tread, riser and landings.
3. Resilient molding accessories.

B. Related Requirements:

1. Section 096466 "Athletic Wood Flooring" for resilient base installed as part of athletic wood flooring system.

1.2 ACTION SUBMITTALS

A. Sustainable Design Submittals: Provide Sustainable Design Submittals in Accordance with Section 018113.

1. Building Product Disclosure Requirements: To encourage the use of building products that are working to minimize their environmental and health impacts, provide the following information when available:

- a. Environmental Product Declaration: Submit with Product-specific Type III or Industry-wide Type III Environmental Product Declaration (EPD).
- b. Material Ingredient Reporting: Submit Cradle to Cradle (C2C) certification (v2 Basic or v3 Bronze level), Health Product Declaration (HPD), or Declare product labels.

2. General Emissions Evaluation: Adhesives and Sealants must be tested and determined compliant in accordance with California Department of Public Health (CDPH) Standard Method v1.2-2017, using the applicable exposure scenario. Show compliance with VOC limits as detailed in Section 01 8113 "VOC Limits".

VOC Content Requirement for Wet Applied Products: All adhesives and sealants wet-applied on site must meet the applicable VOC limits of the South Coast Air Quality Management District (SCAQMD) Rule 1168, effective October 6, 2017.

3. Recycled Content: The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.

4. Regional Materials: Materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles (160 km) of Project Site. If only a fraction of a product or material is extracted/harvested/recovered and manufactured locally, then only that percentage (by weight) shall contribute to the regional value.

B. Product Data: For each type of product indicated

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.

1.3 QUALITY ASSURANCE

- A. 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.
- B. Mockups: Provide resilient products with mockups specified in other Sections.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C).

1.5 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 resilient products during the following time periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.
- B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).
- C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 RESILIENT BASE

- A. Resilient Base: Type 1
 - 1. Basis-of-Design Product: Provide Roppe Corporation, or comparable products by one of the following:
 - a. Johnsonite.
 - b. Nora Systems Inc.
- B. Resilient Base Standard: ASTM F 1861.
 - 1. Material Requirement: Type TP (rubber, thermoplastic).
 - 2. Manufacturing Method: Group I (solid, homogeneous).
 - 3. Style: Standard
- C. Minimum Thickness: 0.125 inch (3.2 mm).
- D. Height: 4 inches (102 mm).
- E. Lengths: Coils in manufacturer's standard length.

- F. Outside Corners: Job formed or preformed.
- G. Inside Corners: Job formed or preformed.
- H. Finish: Smooth.
- I. Colors and Patterns: #193 Black Brown

2.2 RUBBER STAIR ACCESSORIES

- A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E648 or NFPA 253 by a qualified testing agency.
 - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.
- B. Basis of Design Product: Roppe Corporation, #19 Heavy Duty Round Nose
- C. Stair Treads: ASTM F2169.
 - 1. Type: rubber, thermoplastic.
 - 2. Profile: Ribbed
 - 3. Group: 1 embedded abrasive strips.
 - 4. Nosing Style: Round bullnose
 - 5. Nosing Height: 7/8"
 - 6. Thickness: Nominal 1/4 inch.
 - 7. Size: Lengths and depths to fit each stair tread in one piece.
 - 8. Risers: Smooth, flat; in height that fully covers substrate.
- D. Stringers: Height and length after cutting to fit risers and treads and to cover stair stringers, produced by same manufacturer as treads, and recommended by manufacturer for installation with treads.
 - 1. Thickness: Manufacturer's standard.
- E. Landing Tile: Matching treads
- F. Locations: Provide rubber stair accessories in areas indicated.
- G. Colors and Patterns: #638 Cadet

2.3 RUBBER MOLDING ACCESSORY

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Roppe Corporation, USA.

Description: Rubber reducer strips for resilient flooring and transition strips.
- B. Colors and Patterns: #638 Cadet

2.4 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.
 - 1. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - a. Cove Base Adhesives: Not more than 50 g/L.
 - b. Rubber Floor Adhesives: Not more than 60 g/L.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates for Resilient Stair Treads and Accessories: 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.
 - 4. Moisture Testing: Perform tests recommended by manufacturer.
- 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 resilient products until they are same temperature as the space where they are to be installed.
 - 1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
- E. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.3 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.

- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.
- F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
- G. Preformed Corners: Install preformed corners before installing straight pieces.
- H. Job-Formed Corners:
 - 1. Outside Corners: Use straight pieces of maximum lengths possible. Form without producing discoloration (whitening) at bends.
 - 2. Inside Corners: Use straight pieces of maximum lengths possible.

3.4 RESILIENT ACCESSORY INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient accessories.
- B. Resilient Stair Accessories:
 - 1. Use stair-tread-nose filler to fill nosing substrates that do not conform to tread contours.
 - 2. Tightly adhere to substrates throughout length of each piece.
 - 3. For treads installed as separate, equal-length units, install to produce a flush joint between units.
- C. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.
- B. Perform the following operations immediately after completing resilient product installation:
 - 1. Remove adhesive and other blemishes from exposed surfaces.
 - 2. Sweep and vacuum surfaces thoroughly.
 - 3. Damp-mop surfaces to remove marks and soil.
- C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Cover resilient products until Substantial Completion.

END OF SECTION

SECTION 096519 - RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Resilient Floor Tile

B. Related Sections:

1. Section 096516 "Resilient Base and Accessories" for resilient base, rubber stair treads, rubber floor installed on stair landings, reducer strips, and other accessories installed with resilient floor coverings.

1.2 ACTION SUBMITTALS

A. Sustainable Design Submittals: Provide Sustainable Design Submittals in Accordance with Section 018113.

1. Building Product Disclosure Requirements: To encourage the use of building products that are working to minimize their environmental and health impacts, provide the following information when available:
 - a. Environmental Product Declaration: Submit with Product-specific Type III or Industry-wide Type III Environmental Product Declaration (EPD).
 - b. Material Ingredient Reporting: Submit Cradle to Cradle (C2C) certification (v2 Basic or v3 Bronze level), Health Product Declaration (HPD), or Declare product labels.
2. General Emissions Evaluation: Adhesives and Sealants must be tested and determined compliant in accordance with California Department of Public Health (CDPH) Standard Method v1.2-2017, using the applicable exposure scenario.
Show compliance with VOC limits as detailed in Section 01 8113 "VOC Limits".
VOC Content Requirement for Wet Applied Products: All adhesives and sealants wet-applied on site must meet the applicable VOC limits of the South Coast Air Quality Management District (SCAQMD) Rule 1168, effective October 6, 2017.
3. Recycled Content: The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.
4. Regional Materials: Materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles (160 km) of Project Site. If only a fraction of a product or material is extracted/harvested/recovered and manufactured locally, then only that percentage (by weight) shall contribute to the regional value.

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

C. Samples for Initial Selection: For each type of floor tile indicated.

D. Samples for Verification: Full-size units of each color and pattern of floor tile required.

E. Maintenance Data: For each type of floor tile to include in maintenance manuals.

1.3 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents
 - 1. Floor Tile: Furnish (1) box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed

PART 2 - PRODUCTS

2.1 RESILIENT FLOORING TILE

- A. Basis-of-Design Product: Roppe Corporation, Homogenous Performance Compound Rubber Tile Flooring
 - 1. Other manufacturers subject to compliance with requirements, products by manufactures may be submitted under the provisions of Division 01, Substitution Procedures
- B. Tile Standard: ASTM F 1344 Rubber Floor Tile, Class 1 A, Grade 1
- C. Wearing Surface: Smooth.
- D. Thickness: 0.125 inch.
- E. Size: 20 by 20, nominal
- F. Edge Treatment: Micro Bevel
- G. Colors and Patterns:
 - 1. RTF-1: R123 CHARCOAL
 - 2. RTF-2: R174 SMOKE
 - 3. RTF-3: R656 BLUEBELL

2.2 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by manufacturer to suit floor tile and substrate conditions indicated.
 - 1. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - a. VCT and Asphalt Tile Adhesives: Not more than 50 g/L.
- C. Floor Polish: Provide protective liquid floor polish products as recommended by manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates: Prepare according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
 - 4. Moisture Testing: Perform moisture testing per the manufacturer's recommendations to determine conditions, it is recommended to treat new and existing slabs a little bit different to ensure adequate conditions exist for installation.
 - a. New Slabs on all grade levels: it is recommended to perform ASTM F2170 Relative Humidity testing no more than a week prior to installation to determine the levels present and when to proceed with the installation.
- C. Wood Substrates: wood substrates must have a minimum of 18 inches (45.7 cm) of cross ventilated space beneath the joist.
 - 1. Wood substrates must be a minimum 1 inch thick with a double layer construction.
 - 2. Wood substrates must be rigid and free of movement
 - 3. Wood substrates must not be OSB (Oriented Strand Board), particle board, chipboard, luan, fiberboard, or cementitious tile backer board.
 - 4. Wood substrates that are Single Wood or Tongue & Groove subfloors must be covered with the appropriate APA approved underlayment plywood:
 - a. Boards with a face width of 3 inches (7.62 cm) or less and is tongue-and-groove and with a smooth surface, use minimum 1/4 of an inch (6.4 mm) underlayment panels.
 - b. Boards with a face width greater than 3 inches (7.62 cm) or not tongue-and-groove, or with a rough surface, use minimum 1/2 of an inch (12.7 mm) underlayment panels.
- D. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
- E. Do not install floor tiles until they are same temperature as space where they are to be installed.

1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
- F. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.3 FLOOR TILE INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor tile.
- B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
1. Lay tiles square with room axis.
- C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
1. Lay tiles with grain direction alternating in adjacent tiles (basket-weave pattern)..
- D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent, nonstaining marking device.
- G. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protection of floor tile.
- B. Perform the following operations immediately after completing floor tile installation:
1. Remove adhesive and other blemishes from exposed surfaces.
 2. Sweep and vacuum surfaces thoroughly.
 3. Damp-mop surfaces to remove marks and soil.
- C. Protect floor tile products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Floor Polish: Remove soil, visible adhesive, and surface blemishes from floor tile surfaces before applying liquid floor polish.
- E. Cover floor tile until Substantial Completion.

- F. Manufacturer's Field Representative to include providing cleaning and maintenance training and demonstration to Philadelphia Park and Recreation Department's staff. Manufacturer's Representative to confirm in writing that the installation meets the manufacturer's installation and cleaning recommendations at completion.

END OF SECTION

SECTION 096750 – RESINOUS FLOORING AND COATINGS

PART 1- GENERAL

1.1 SUMMARY

- A. This Section includes all labor, materials, equipment and services necessary to complete the installation of:
 - 1. Seamless flooring system applied over new cast in place concrete slab on grade and applied over existing wood floor substrate
 - a. Decorative urethane mortar with colored quartz broadcast aggregate.
 - b. Polyaspartic topcoat
 - c. Integral cove base
 - 2. Acrylic cement underlayment for installation on existing wood and tile substrates.
- B. Related Requirements:
 - 1. Section 03 300 “Cast-in-Place Concrete”
 - 2. Section 09 3012 “Ceramic Tiling” for ceramic tile and metal transition strips.
 - 3. Division 22 - floor drains and clean outs

1.2 PREINSTALLATION MEETING

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review methods and procedures related to flooring installation including, but not limited to, the following:
 - a. Inspect and discuss condition of substrate and other preparatory work performed by other trades.
 - b. Review installation details and suitable location for installation of mock-up.
 - c. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

1.03 ACTION SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product Data: Submit manufacturer's technical data, application instructions and general recommendations for the urethane cement composition flooring specified herein.

- C. Samples for initial selection showing the full range of colors including decorative quartz available.
 - 1. Submit 2-1/2" x 4" samples in custom color as selection shall be designated by the Architect.
- D. Samples for Verification: For each resinous flooring system or color specified, provide 3 each, 6 inches (150mm) square samples in the selected color and texture. Submit samples with quick glaze sealer in both glossy and satin finish. Each sample shall be applied to a ridged backing by the installing contractor for this project. Label each sample with the manufacturer's body, mix and aggregate type, sizes, proportion and glaze finish.

1.4 INFORMATIONAL SUBMITTALS

- A. Material certificates signed by manufacturer certifying that the urethane cement composition flooring supplied for the project complies with requirements specified herein.
- B. Maintenance Instructions: Submit manufacturer's written instructions for recommended maintenance practices.
- C. Contractor Certification: Submit a letter from the primary materials manufacturer certifying that the installing contractor has been properly trained in the application of the materials being installed, is acceptable to the materials manufacturer, with a record of successful in-service performance.
 - 1. Engage an installer who employs only persons trained and approved by the resinous flooring manufacturer for applying resinous flooring systems specified.
 - 2. Engage an installer who is certified in writing by the resinous flooring manufacturer as a factory trained applicator qualified to apply the specified resinous flooring system.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer or applicator that has specialized in installing resinous flooring types similar to that required for this Project and who is acceptable to manufacturer of primary materials.
- B. Single-Source Responsibility: Obtain urethane cement composition flooring materials, including primers, resins, hardening agents, and finish or sealing coats, from a single manufacturer. Provide secondary materials, including patching and fill materials, joint sealant, accessory items, and repair materials. Of a type and from a source recommended by the manufacturer of the primary materials
- C. Mockups: Apply mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set the standard of quality for materials and installation.
 - 1. Mock-up to be installed on a separately constructed base model to replicates existing conditions. At a minimum the mock-up sample shall be 5 foot x 5 foot with a tile substrate to match the existing floor and include two sides of an interior corner. The installation is to ensure that there will be no telegraphing of the tile grouts lines and to

demonstrate the finish cove base, joint detailing, interior corner, terminations and any other special conditions. Apply all components of the specified resinous flooring system at the specified thickness and finished in the texture and color as selected. Application to simulate the actual installation characteristics.

- a. Simulate finished lighting conditions for Architects review of mockups.

1.6 DELIVERY, STORAGE AND HANDLING

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

1.7 PROJECT CONDITIONS

- A. Environmental Conditions: Comply with urethane cement composition flooring manufacturer's directions for maintenance of ambient and substrate temperature, moisture, humidity, ventilation, and other conditions required to execute and protect Work.
- B. Lighting: Permanent lighting or fully illuminated conditions must be in place and working before installing resinous flooring.
- C. Close spaces to traffic during urethane cement flooring application and for not less than 24 hours after application unless manufacturer recommends a longer period.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design, subject to compliance with requirements, provide the following products as manufactured by Crossfield Products Corp. in Rancho Dominguez, California and Roselle Park or comparable product by another manufacturer.

1. Underlayment: Dex-O-Tex A-81 Underlayment
2. Urethane Concrete Flooring: Dex-O-Tex Tek-Crete SL-CQ
3. Polyaspartic Topcoat: Dex-O-Tex Quik- Glaze

2.2 UNDERLAYMENT

- A. Polymer modified, pre-packaged cementitious sloping, leveling and patching compound with a wire reinforcing mesh, installed at a nominal 1/8" – 3/16" thickness.

1. Physical Properties:
 - a. VOC in g/L (40 CFR 60): 0 g/L
 - b. Compressive Strength (ASTM C307): 4,140psi.
 - c. Tensile Strength (ASTM C307): 800 psi.
 - d. Flexural Strength (ASTM C580): 1,200 psi.
 - e. Hardness (ASTM D2240, Shore D): 70-75

- f. Water Absorption (MIL-D-3134): 3.14%

2.3 URETHANE CONCRETE FLOORING

A. Troweled Urethane Cement Composition Flooring with Decorative Color Quartz Broadcast:

1. Physical Properties:

- a. Compressive Strength (ASTM C579): 6,100 psi (42.0 MPa).
- b. Thermal Distortion (250 degrees F Emersion): Passes.
- c. Tensile Strength (ASTM C307): 1,000 psi (6.89 MPa).
- d. Flexural Strength (ASTM C580): 2,000 psi (13.8 MPa).
- e. Thermal Co-Efficient of Thermal Expansion (ASTM C531): $1.4 \times 10E5$.
- f. Density (ASTM C905): 130 pcf (20.4 kN/cu.m).
- g. Water Absorption (MIL-PRF-3134): 0.64 percent.
- h. Surface Hardness (ASTM D2240) 85-90 Durometer "D".
- i. Abrasion Resistance (ASTM D1044): 33mg.
- j. Adhesion (ASTM D4541): 400 psi (2.76 MPa), 100 percent failure in concrete.
- k. Flammability-Critical Radiant Flux (ASTM E648): 1.07 watts/sq.cm.
- l. Resistance to Fungal Growth (ASTM G21): Passes, Rating 1.

- 2. Colors: As selected by Architect from manufacturer's standard colors.
- 3. Body Coat: 3/16 to 1/4 inch (5 to 6 mm) thick with colored quartz broadcast.
- 4. Top Coat: Clear gloss, UV and abrasion resistant, high build Polyaspartic.

B. Polyaspartic Topcoat: Sealing or finish coats, 95 percent solids formulation.

- 1. Types: Clear type and pigmented type, as indicated or directed.
- 2. Finish: Matte.
- 3. Number of Coats: One.
- 4. Physical Properties: Provide products with the following minimum physical property requirements when tested according to test methods indicated:
 - a. Tear Strength: 879 lbs/in. according to ASTM D 624, Die C.
 - b. Tensile Strength: 2,400 psi minimum according to ASTM D 412.
 - c. Hardness: 85-90, Shore D according to ASTM D 2240.
 - d. UV stable.

- C. Anti-Microbial Additive: Sealing or finish coats, 95 percent solids formulation.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Examine the areas and conditions where the urethane cement composition flooring is to be installed and notify the Architect of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected by the Contractor in a manner acceptable to the Architect.

3.2 PREPARATION

- A. Substrate: Perform preparation and cleaning procedures according to flooring manufacturer's instructions for particular substrate conditions involved, and as specified. Provide clean, dry, and neutral substrate for flooring application.
- B. Wooden Subfloor: Mechanically prepare the surface via sanding as required to obtain optimum bond of flooring to substrate. Remove sufficient material to provide a sound surface, free of laitance and any bond-inhibiting agents.
- C. Concrete Surfaces: Shot-blast, or diamond grind per SSPC SP-13/NACE 6. Remove material to provide a sound surface free of laitance, glaze, efflorescence, bond inhibiting curing compounds or form release agents. Remove grease, oil, and other penetrating contaminates. Repair damaged and deteriorated concrete to acceptable condition per ACI 546.R-04. Produce a surface profile equal to ICRI 310.25 CPS 2, CPS 3, or CPS 4. Leave surface free of dust, dirt, laitance, and efflorescence.
- D. Underlayment: Over the prepared substrate, staple down 1/8" galvanized diamond mesh, overlapping the seams 1". Apply the acrylic cement according to the manufacturer's written instructions, covering the mesh in its entirety, leaving a smooth surface.
- E. Materials: Mix resin hardener and aggregate as required, and prepare materials according to flooring system manufacturer's instructions.

3.3 APPLICATION

- A. General: Apply each component of urethane cement composition flooring system according to manufacturer's directions to produce a uniform monolithic flooring surface of thickness indicated.
- B. Body Coat: Over prepared surface, Screed mortar mix at nominal 3/16" – ¼"-inch thickness as specified. Allow material flow out and begin to settle. Back roll with a spike roller or looped roller as appropriate to distribute material to a smooth even finish.
- C. Install 4" integral cove base with 5/8" radius at all vertical horizontal transitions.
- D. Broadcast Aggregate: Broadcast selected colored quartz aggregate blend into the wet Body Coat. Apply to an even distribution and texture, allow to cure.
- E. Remove Excess Aggregate: Remove all loose or unsound colored quartz aggregate from the cured

surface. Vacuum up all dust and fine particles from the surface, remove any ridge lines and detail all imperfection in the textured surface.

- F. Finish or Sealing Coats: After quartz filled broadcast coats have cured sufficiently, apply finish coats of type recommended by flooring manufacturer to produce finish matching approved submittal sample and in number of coats and spreading rates recommended by manufacturer. Finished floor shall be a nominal 3/16" – 1/4" thick.

3.4 CURING, PROTECTION AND CLEANING

- A. Cure urethane cement composition flooring materials according to manufacturer's directions, taking care to prevent contamination during application stages and before completing curing process. Close application area for a minimum of 96 hours.
- B. Provide floor protection acceptable to the materials manufacturer.

END OF SECTION 096750

SECTION 097213 - CORK WALL COVERINGS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Cork Wall Coverings Bulletin Board, Adhesive Installation
- B. Related Requirements:
 - 1. Section 062023 "Finish Carpentry" for wood trim

1.02 ACTION SUBMITTALS

- A. Sustainable Design Submittals: Provide Sustainable Design Submittals in Accordance with Section 018113.
 - 1. Building Product Disclosure Requirements: To encourage the use of building products that are working to minimize their environmental and health impacts, provide the following information when available:
 - a. Environmental Product Declaration: Submit with Product-specific Type III or Industry-wide Type III Environmental Product Declaration (EPD).
 - b. Material Ingredient Reporting: Submit Cradle to Cradle (C2C) certification (v2 Basic or v3 Bronze level), Health Product Declaration (HPD), or Declare product labels.
 - 2. Recycled Content: The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.
 - 3. Regional Materials: Materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles (160 km) of Project Site. If only a fraction of a product or material is extracted/harvested/recovered and manufactured locally, then only that percentage (by weight) shall contribute to the regional value.
- B. Product Data: Submit product data for specified products.
- C. Shop Drawings: Submit shop drawings showing layout, profiles, and product components, including anchorage, accessories, finish colors, patterns and textures.
- D. Samples: Submit samples for finishes, colors, and textures.

1.03 INFORMATIONAL SUBMITTALS

- A. Quality Assurance Submittals
 - 1. Manufacturers Technical Data: Manufacturers document specifying performance characteristics and criteria, and physical requirements.
 - 2. Manufacturer's Instructions: Manufacturer's installation instructions.

1.04 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: Operation and maintenance data for installed products in accordance with Division 1 Closeout Submittals (Maintenance Data and Operation Data) Section. Include methods for maintaining installed products, and precautions against cleaning materials and methods detrimental to finishes and performance.
- B. Warranty: Warranty documents specified herein.

1.05 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.

1. Certificate: Submit certificate indicating installer qualifications for project

B. Regulatory Requirements:

1. Fire Performance Characteristics: Provide material with the following fire performance characteristics as determined by testing products in accordance with the latest version of ASTM method indicated below by a certified testing laboratory or another testing and inspecting agency acceptable to authorities having jurisdiction:

a. Tunnel Furnace Test Method: Class B Rating (ASTM E 84/NFPA 255)

1.06 DELIVERY, STORAGE, AND HANDLING

A. General: Comply with Division 1 Product Requirements Sections.

B. Ordering: Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.

C. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

D. Storage and Protection: Store materials protected from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer.

1. Material should be stored in areas that are fully enclosed and weathertight. The permanent HVAC should be fully operational, controlled and set at a minimum of 68° F (20° C) for at least 48 hours prior to the installation.

1.07 WARRANTY

A. Project Warranty: Refer to "Conditions of the Contract" for project warranty provisions.

B. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under Contract Documents.

1. Warranty Period: Five (5) year limited warranty commencing on Date of Substantial Completion.

1.08 MAINTENANCE

A. Extra Materials: Deliver to Owner extra materials from same production run as products installed. Package products with protective covering and identify with descriptive labels. Comply with Division 1 Closeout Submittals (Maintenance Materials) Section.

1. Quantity: Furnish quantity of material units equal to 5% of amount installed.

2. Delivery, Storage and Protection: Comply with Owner's requirements for delivery, storage and protection of extra materials.

PART 2 – PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.

2. Smoke-Developed Index: 50 or less.

2.02 CORK WALL COVERINGS

- A. Basis-of-Design Manufacturer: Forbo Flooring, Inc, or comparable product
- B. Obtain product materials from a single manufacturer.
- C. Bulletin Board Sheet and Adhesive.
 - 1. Description: Homogeneous tackable surface material made of primary natural materials consisting of linseed oil, cork, rosin binders and dry pigments mixed and calendared onto a natural jute backing. The uni-color extends throughout the thickness of the material.
 - 2. Width: As indicated on drawings
 - 3. Length: As indicated on drawings
 - 4. Gauge: 6.0mm (1/4")
 - 5. Backing: Jute
 - 6. Pattern and Color: 2212 Fresh Pineapple
 - 7. Adhesive: Forbo L 910W Adhesive

PART 3 – EXECUTION

3.01 INSTALLATION

- A. General: Comply with manufacturer's product data, including product technical bulletins, product catalog installation instructions, and product carton instructions for installation.
- B. Site Verification of Conditions: Verify substrate conditions (which have been previously installed under other sections) are acceptable for product installation in accordance with manufacturer's instructions (bond testing, etc.).
- C. Material Inspection: In accordance with manufacturer's installation requirements, visually inspect materials prior to installation. Material with visual defects shall not be installed and shall not be considered as a legitimate claim.
- D. Adjacent Surfaces Protection: Protect adjacent work areas and finish surfaces from damage during product installation.
- E. Surface Preparation:
 - 1. General: Prepare substrate in accordance with manufacturer's instructions.
 - 2. Substrate: Substrate shall be sound, smooth, flat, permanently dry, clean, and free of all foreign materials including, but not limited to, dust, paint, grease, oils, solvents, curing and hardening compounds, sealers, asphalt and old adhesive residue.
- F. Material Installation: Cut required length from roll, allowing 2-3 inches overlap. Lay sheets flat to acclimate, preferably 48 hours prior to installation. Back roll sheets once in reverse direction to release roll stretch. Remove the factory edge from both sides of the material. Apply adhesive and place sheet into wet adhesive and roll with a three-section wall roller.
- G. Adhesive Installation: Use trowel as recommended by manufacturer for specific adhesive (1/8" x 1/8" x 1/16" V notch trowel). Spread rate is approximately 90 ft²/gallon.
- H. Installation Techniques: Apply the material to substrate without producing open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, or other surface imperfections in completed installation.
 - 1. Use adhesive applied to substrate in compliance with manufacturer's recommendations, including those for mixing, trowel notch, and adhesive open and working times.
 - 2. Roll material as required by manufacturer.
- I. Finish Patterns: [As selected by Architect.]

3.02 CLEANING

- A. Cleaning: Remove temporary coverings and protection of adjacent work areas. Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions prior to owner's acceptance. Remove construction debris from project site and legally dispose of debris.
 - 1. Remove visible adhesive and other surface blemishes using cleaning methods recommended by manufacturer.
 - 2. Dust or wipe with a damp cloth.

3.03 PROTECTION

- A. Protection: Protect installed product and finish surfaces from damage during construction. Remove and legally dispose of protective covering at time of Substantial Completion.

END OF SECTION

SECTION 097720 – FIBERGLASS REINFORCED WALL PANELS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Prefinished polyester glass reinforced plastic sheets and adhered to unfinished gypsum wallboard.
 - 1. PVC trim.

1.2 SUBMITTALS

- A. Sustainable Design Submittals: Provide Sustainable Design Submittals in Accordance with Section 018113.
 - 1. Building Product Disclosure Requirements: To encourage the use of building products that are working to minimize their environmental and health impacts, provide the following information when available:
 - a. Environmental Product Declaration: Submit with Product-specific Type III or Industry-wide Type III Environmental Product Declaration (EPD).
 - 2. General Emissions Evaluation: Adhesives and Sealants must be tested and determined compliant in accordance with California Department of Public Health (CDPH) Standard Method v1.2-2017, using the applicable exposure scenario.
 - 3. Recycled Content: The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.
 - 4. Regional Materials: Materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles (160 km) of Project Site. If only a fraction of a product or material is extracted/harvested/recovered and manufactured locally, then only that percentage (by weight) shall contribute to the regional value.
- B.
- C. Product Data: Submit sufficient manufacturer's data to indicate compliance with these specifications, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- D. Shop Drawings: Submit elevations of each wall showing location of paneling and trim members with respect to all discontinuities in the wall elevation.
- E. Selection Samples: Submit manufacturer's standard color pattern selection samples representing manufacturer's full range of available colors and patterns.
- F. Samples for Verification: Submit appropriate section of panel for each finish selected indicating the color, texture, and pattern required.
 - 1. Submit complete with specified applied finish.
 - 2. For selected patterns show complete pattern repeat.

3. Exposed Molding and Trim: Provide samples of each type, finish, and color.
- G. Manufacturers Material Safety Data Sheets (MSDS) for adhesives, sealants and other pertinent materials prior to their delivery to the site.

1.3 QUALITY ASSURANCE

- A. Conform to building code requirements for interior finish for smoke and flame spread requirements as tested in accordance with:
1. ASTM E 84 (Method of test for surface burning characteristics of building Materials)
 - a. Wall Required Rating – Class [A] [C].
- B. Sanitary Standards: System components and finishes to comply with:
1. United States Department of Agriculture (USDA) requirements for food preparation facilities, incidental contact.
 2. Food and Drug Administration (FDA) 1999 Food Code 6-101.11.
 3. Canadian Food Inspection Agency (CFIA) requirements.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials factory packaged on strong pallets.
- B. Store panels and trim lying flat, under cover and protected from the elements. Allow panels to acclimate to room temperature (70°) for 48 hours prior to installation.

1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Building are to be fully enclosed prior to installation with sufficient heat (70°) and ventilation consistent with good working conditions for finish work
- B. During installation and for not less than 48 hours before, maintain an ambient temperature and relative humidity within limits required by type of adhesive used and recommendation of adhesive manufacturer.
1. Provide ventilation to disperse fumes during application of adhesive as recommended by the adhesive manufacturer.

1.6 WARRANTY

- A. Furnish one year guarantee against defects in material and workmanship.

PART 2 - PRODUCTS

2.1 BASIS-OF-DESIGN MANUFACTURER

- A. Basis-of-Design Product: Marlite; Standard FRP

2.2 PANELS

- A. Fiberglass reinforced thermosetting polyester resin panel sheets complying with ASTM D 5319.
 - 1. Coating: Multi-layer print, primer and finish coats or applied over-layer.
 - 2. Dimensions:
 - a. Thickness – 0.090 “ (2.29mm) nominal
 - b. Dimensions – As indicated on drawings, nominal 4’x8’ panels
 - 3. Tolerance:
 - a. Length and Width: +/-1/8 “ (3.175mm)
 - b. Square - Not to exceed 1/8 “ for 8 foot (2.4m) panels or 5/32 “ (3.96mm) for 10 foot (2.4m) panels

- B. Properties: Resistant to rot, corrosion, staining, denting, peeling, and splintering.
 - 1. Flexural Strength - 1.0×10^4 psi per ASTM D 790. (7.0 kilogram-force/square millimeter)
 - 2. Flexural Modulus - 3.1×10^5 psi per ASTM D 790. (217.9 kilogram-force/square millimeter)
 - 3. Tensile Strength - 7.0×10^3 psi per ASTM D 638. (4.9 kilogram-force/square millimeter)
 - 4. Tensile Modulus - 1.6×10^5 psi per ASTM D 638. (112.5 kilogram-force/square millimeter)
 - 5. Water Absorption - 0.72% per ASTM D 570.
 - 6. Barcol Hardness (scratch resistance) of 35 55 as per ASTM D 2583.
 - 7. Izod Impact Strength of 72 ft. lbs./in ASTM D 256

- C. Back Surface: Smooth. Imperfections which do not affect functional properties are not cause for rejection.

- E. Front Finish:
 - a. Color: S100G White
 - b. Surface: Smooth
 - c. Fire Rating: Class A
 - d. Size: As indicated on drawings

2.3 MOLDINGS

- A. PVC Trim: Thin-wall semi-rigid extruded PVC.

2.4 ACCESSORIES

- A. Fasteners: Non-staining nylon drive rivets.
 - 1. Match panel colors.
 - 2. Length to suit project conditions.

- B. Adhesive: Either of the following construction adhesives complying with ASTM C 557.
 - 1. Manufacturer’s recommended adhesive

- C. Sealant:
 - 1. Manufacturer’s recommended sealant

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine backup surfaces to determine that corners are plumb and straight, surfaces are smooth, uniform, clean and free from foreign matter, nails countersunk, joints and cracks filled flush and smooth with the adjoining surface.
 - 1. Verify that stud spacing does not exceed 24" (61cm) on-center.
- B. Repair defects prior to installation.
 - 1. Level wall surfaces to panel manufacturer's requirements. Remove protrusions and fill indentations.

3.2 INSTALLATION

- A. Comply with manufacturer's recommended procedures and installation sequence.
- B. Cut sheets to meet supports allowing 1/8" (3 mm) clearance for every 8 foot (2.4m) of panel.
 - 1. Cut and drill with carbide tipped saw blades or drill bits, or cut with shears.
 - 2. Pre-drill fastener holes 1/8" (3mm) oversize with high speed drill bit.
 - a. Space at 8" (200mm) maximum on center at perimeter, approximately 1" from panel edge
 - b. Space at in field in rows 16' (40.64cm) on center, with fasteners spaced at 12" (30.48 cm) maximum on center.
- C. Apply panels to board substrate, above base, vertically oriented with seams plumb and pattern aligned with adjoining panels.
 - 1. Install panels with manufacturer's recommended gap for panel field and corner joints.
 - a. Adhesive trowel and application method to conform to adhesive manufacturer's recommendations.
 - b. Drive fasteners for snug fit. Do not over-tighten.
- D. Apply panel moldings to all panel edges using silicone sealant providing for required clearances.
 - 1. All moldings must provide for a minimum 1/8 " (3mm) of panel expansion at joints and edges, to insure proper installation.
 - 2. Apply sealant to all moldings, channels and joints between the system and different materials to assure watertight installation.

3.3 CLEANING

- A. Remove excess sealant from panels and moldings. Wipe panel down using a damp cloth and mild soap solution or cleaner.
- B. Refer to manufacturer's specific cleaning recommendations Do not use abrasive cleaners.

END OF SECTION

SECTION 098434 - SOUND-ABSORBING CEILING UNITS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Fixed, direct-mounted cementitious wood fiber sound-absorbing panel units tested for acoustical performance

1.2 ACTION SUBMITTALS

- A. Sustainable Design Submittals: Provide Sustainable Design Submittals in Accordance with Section 018113.
 - 1. Building Product Disclosure Requirements: To encourage the use of building products that are working to minimize their environmental and health impacts, provide the following information when available:
 - a. Environmental Product Declaration: Submit with Product-specific Type III or Industry-wide Type III Environmental Product Declaration (EPD).
 - 2. General Emissions Evaluation: Adhesives and Sealants must be tested and determined compliant in accordance with California Department of Public Health (CDPH) Standard Method v1.2-2017, using the applicable exposure scenario. Show compliance with VOC limits as detailed in Section 01 8113 "VOC Limits". VOC Content Requirement for Wet Applied Products: All adhesives and sealants wet-applied on site must meet the applicable VOC limits of the South Coast Air Quality Management District (SCAQMD) Rule 1168, effective October 6, 2017. Product Data: For each type of product indicated.
- B. Shop Drawings: For sound-absorbing panels. Include mounting devices and details.
- C. Samples: For each exposed product and for each color and texture specified.

1.3 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plans and other details, drawn to scale, and coordinated with each other, using input from installers of the items involved.
- B. Product Certificates: For each type of sound-absorbing ceiling unit.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For sound-absorbing ceiling panels.

1.5 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials, fabrication, and installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: Provide sound-absorbing panels meeting the following as determined by testing identical products by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

1. Surface-Burning Characteristics: As determined by testing per ASTM E 84.

- a. Flame-Spread Index: 25 or less.
- b. Smoke-Developed Index: 50 or less.

2.2 SOUND-ABSORBING CEILING PANELS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong World Industries, Inc.; TECTUM® Direct-Attach High NRC.
- B. Cementitious Wood Fiber Sound-Absorbing Panels: Manufacturer's standard panel construction composed of aspen wood fibers bonded with inorganic hydraulic cement.

1. Panel Characteristics:

- a. Finish and Color: Custom, painted to match adjacent ceilings
- b. Edge Detail: Long edge beveled, short edge square.
- c. Acoustical Performance: Sound absorption NRC of not less than 0.90.
- d. Thickness: 1 inch (25 mm).
- e. Modular Size: Nominal 24" x 48"
- f. Attachment Method: Mechanically fastened with furring strips and insulation board.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install sound-absorbing ceiling panels in locations indicated with vertical surfaces and edges plumb, top edges level and in alignment with other panels, faces flush, and scribed to fit adjoining work accurately at borders and at penetrations.
- B. Comply with sound-absorbing unit manufacturer's written instructions for installation of panels using type of mounting devices indicated. Mount panels securely to supporting substrate.
- C. Clean panels on completion of installation to remove dust and other foreign materials according to manufacturer's written instructions.

END OF SECTION

SECTION 099000 - PAINTING AND COATING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Surface preparation and the application of paint systems on exterior and interior substrates.
- B. Paint exposed exterior and interior substrates, except where schedules indicate that a surface or material is not to be painted or is to remain natural. If 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 schedules do not indicate color or finish, the Architect will select from standard colors and finishes available.
 - 1. Do not paint prefinished items, integrally finished systems, finished metal surfaces, operating parts, and labels, unless otherwise indicated.
 - 2. Prefinished items include the following shop- or factory-finished components:
 - a. Elevator entrance doors and frames.
 - b. Finished mechanical and electrical equipment.
 - c. Lighting fixtures.
 - 3. Finished metal surfaces include the following:
 - a. Anodized aluminum.
 - b. Stainless steel.
 - c. Chromium plate.
 - d. Copper.
 - e. Bronze and brass.

1.2 DEFINITIONS

- A. Gloss Level 2 (Low Sheen): Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- B. Gloss Level 3 (Eggshell): 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- C. Gloss Level 4 (Satin): 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
- D. Gloss Level 5 (Semi-Gloss): 35 to 70 units at 60 degrees, according to ASTM D 523.

1.3 ACTION SUBMITTALS

- A. Sustainable Design Submittals: Provide Sustainable Design Submittals in Accordance with Section 018113.

1. Building Product Disclosure Requirements: To encourage the use of building products that are working to minimize their environmental and health impacts, provide the following information when available:
 - a. Environmental Product Declaration: Submit with Product-specific Type III or Industry-wide Type III Environmental Product Declaration (EPD).
 - b. Material Ingredient Reporting: Submit Cradle to Cradle (C2C) certification (v2 Basic or v3 Bronze level), Health Product Declaration (HPD), or Declare product labels.
 - B. Product Data: For each type of product. Include preparation requirements and application instructions.
 - C. Samples for Initial Selection: For each type of topcoat product.
 - D. Samples for Verification: For each type of paint system and each color and gloss of topcoat; cured not less than 7 days.
 1. Submit Samples on rigid backing, 12 inches (300 mm) square.
 2. Step coats on Samples to show each coat required for system.
 3. Label each coat of each Sample.
 4. Label each Sample for location and application area.
 - E. Product List: For each product indicated, include the following:
 1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
 2. Printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
 3. VOC content.
- 1.4 MAINTENANCE MATERIAL SUBMITTALS
- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Paint: 5 percent, but not less than 1 gal. (3.8 L) of each material and color applied.
- 1.5 QUALITY ASSURANCE
- A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.
 - a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
 - b. Other Items: Architect will designate items or areas required.
 2. Lighting: Do not apply mockups until a permanent level of lighting is provided on the surfaces to receive paint.
 3. Final approval of color selections will be based on mockups.

- a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
 - 4. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 5. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- 1.6 DELIVERY, STORAGE, AND HANDLING
- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).
 - 1. Maintain containers in clean condition, free of foreign materials and residue.
 - 2. Remove rags and waste from storage areas daily.
- 1.7 FIELD CONDITIONS
- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).
 - B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.
 - C. Provide adequate ventilation, including mechanical ventilation, to remove paint odors and fumes from areas of the building where odors might migrate to occupied spaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Benjamin Moore & Co.
 - 2. Sherwin-Williams Company (The).

2.2 PAINT, GENERAL

- A. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."
- B. Material Quality: Unless otherwise indicated, provide manufacturer's best-quality paint material for each coating type.
- C. Material Compatibility:
 - 1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

- D. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction and, for interior paints and coatings applied at Project site, the following VOC limits, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
1. Flat Paints and Coatings: 50 g/L.
 2. Nonflat Paints and Coatings: 150 g/L.
 3. Dry-Fog Coatings: 400 g/L.
 4. Primers, Sealers, and Undercoaters: 200 g/L.
 5. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.
 6. Zinc-Rich Industrial Maintenance Primers: 340 g/L.
 7. Pretreatment Wash Primers: 420 g/L.
 8. Floor Coatings: 100 g/L.
- E. Colors: As selected by Architect from manufacturer's full range.

2.3 SOURCE QUALITY CONTROL

- A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:
1. Owner will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
 2. Testing agency will perform tests for compliance with product requirements.
 3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
1. Concrete: 12 percent.
 2. Gypsum Board: 12 percent.
- C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- D. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- E. Proceed with coating application only after unsatisfactory conditions have been corrected.
1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- E. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer.
- F. Shop-Primed Steel Substrates: 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 for touching up shop-primed surfaces.
- G. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Manual."
 - 1. Use applicators and techniques suited for paint and substrate indicated.
 - 2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
 - 3. Paint both sides and edges of exterior doors and entire exposed surface of exterior door frames.
 - 4. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
 - 5. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
 - 6. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. Tint undercoats same color as topcoat, but tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Provide sufficient difference in shade of undercoats to distinguish each separate coat.

- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
 - 1. Paint the following work where exposed in occupied spaces:
 - a. Equipment, including panelboards.
 - b. Uninsulated metal piping.
 - c. Uninsulated plastic piping.
 - d. Pipe hangers and supports.
 - e. Metal conduit.
 - f. Plastic conduit.
 - g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
 - h. Other items as directed by Architect.
 - 2. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

3.4 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
 - 1. Contractor shall touch up and restore painted surfaces damaged by testing.
 - 2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 EXTERIOR PAINTING SCHEDULE

A. Steel Substrates:

1. Pigmented Polyurethane over Inorganic Zinc-Rich Primer and Epoxy System:
 - a. Shop-Applied Prime Coat: Primer, zinc-rich, inorganic, MPI #19 or as recommended in writing by topcoat manufacturer.
 - b. Intermediate Coat: Epoxy, for metal.
 - 1) Sherwin-Williams; Macropoxy 646.
 - 2) Tnemec, Inc.; L69.
 - c. Topcoat: Polyurethane, pigmented, semi-gloss (Gloss Level 5).
 - 1) Sherwin-Williams; Hi Solid Polyurethane 100.
 - 2) Tnemec, Inc.; 1071V.

B. Galvanized-Metal Substrates:

1. Latex System:
 - a. Prime Coat: Primer, galvanized metal, as recommended in writing by topcoat manufacturer for exterior use on galvanized-metal substrates with topcoat indicated.
 - b. Intermediate Coat: Latex, exterior, matching topcoat.
 - c. Topcoat: Latex, exterior semi-gloss (Gloss Level 5), MPI #11.

3.7 INTERIOR PAINTING SCHEDULE

A. Concrete Substrates, Nontraffic Surfaces:

1. Institutional Low-Odor/VOC Latex System:
 - a. Prime Coat: Primer sealer, interior, institutional low odor/VOC, MPI #149.
 - b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
 - c. Topcoat: Latex, interior, institutional low odor/VOC, (Gloss Level 2), MPI #144.

B. Steel Substrates:

1. Institutional Low-Odor/VOC Latex System:
 - a. Prime Coat: Primer, rust-inhibitive, water based MPI #107.
 - b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
 - c. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (Gloss Level 5), MPI #147.

C. Galvanized-Metal Substrates: Including exposed metal ductwork.

1. Institutional Low-Odor/VOC Latex System:
 - a. Prime Coat: Primer, galvanized, water based, MPI #134.
 - b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
 - c. Topcoat: Latex, interior, institutional low odor/VOC, flat (Gloss Level 1), MPI #143.

D. Wood Substrates for Painted Finish:

1. Institutional Low-Odor/VOC Latex System:
 - a. Prime Coat: Primer, latex, for interior wood, MPI #39.
 - b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
 - c. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (Gloss Level 5), MPI #147.

- E. Wood Substrates for Transparent Finish: Including plywood wall paneling and built-in plywood casework.
 1. Polyurethane Varnish System:
 - a. First Coat: Polyurethane varnish matching topcoat.
 - b. Second Intermediate Coat: Polyurethane varnish matching topcoat.
 - c. Topcoat: Varnish, interior, polyurethane, oil-modified, satin (Gloss Level 4), MPI #57.

- F. Gypsum Board Substrates:
 1. Institutional Low-Odor/VOC Latex System:
 - a. Prime Coat: Primer sealer, interior, institutional low odor/VOC, MPI #149.
 - b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
 - c. Topcoat: Latex, interior, institutional low odor/VOC, eggshell (Gloss Level 3), MPI #145.

- G. Concrete Masonry Unit Substrates:
 1. Institutional Low-Odor/VOC Latex System:
 - a. Prime Coat: Moorcraft Supercraft Latex Block Filler #285, or approved equal
 - b. Topcoat: Two coats Moorcraft Superspec Low lustre Latex Paint #185, or approved equal.

END OF SECTION

SECTION 100610 - EXTERIOR SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Philadelphia Parks and Recreation Signage Standards Manual, latest version.

1.2 REQUIRED QUALIFICATIONS SUBMITTALS

- C. The awarded Fabricator will have provided their qualifications at or prior to the time of Bid. The Fabricator is required to submit as part of the submittal process additional qualifications for any subcontractors, including but not limited to, installers, electrician, specialty sub-contractor and/or project managers not included or accepted with the bid award of the project. The Owner reserves the right to accept or reject any sub-contractor and/or project manager submitted for review. Qualifications should include: a minimum of 5-10 years relevant experience and shall provide information that illustrates the following:
 - 1. Firm/Personnel qualifications.
 - 2. Projects of similar size and complexity.
 - 3. Demonstration of high quality craftsmanship.
 - 4. Project management team and experience.
- D. Regional Vendors:
 - 1. Urban Sign and Crane
527 E. Chestnut Avenue
Voorhees, NJ 08360
856.691.8388
www.urbansigncompany.com
 - 2. M.S. Signs, Inc.
6 Morris Street
Paterson, NJ 07501
973.569.1111
www.mssign.com
 - 3. L&H Sign Company
425 North 3rd Street
Reading, PA 19601
www.lhsigns.com

4. Compass Sign Co LLC
1505 Ford Road
Bensalem, PA 19020
215.639.677
www.compass-sign.net
5. Allied Environmental Signage
69 Megill Road
Farmingdale, NJ 07727
732.751.1818
www.allied-signs.com
6. Or proposed qualified manufacturer, qualifications to be submitted to the owner for approval during bid process.

1.3 ACTION SUBMITTALS

A. SHOP DRAWINGS

Submit one (1) electronic set of shop drawings as outlined below: Include plans, elevations, sections and large-scale details of sign construction, wording, and lettering layout. Show anchorages and accessory items. Provide graphic layouts of each individual sign face and message for each sign location. Show fabrication and installation details, including all sign components such as: extrusions, brackets, bracing, hardware, internal framing, etc. Alphabet of each type style required by the contract documents, including upper and lowercase, with numerals, punctuation and accents. Shop drawings MUST include all field verified conditions and dimensions. Show installation and mounting heights.

B. PRODUCT SPECS AND WARRANTY INFORMATION

Provide documentation outlining all project warranties, including both product and manufacturing. Submit cut sheets for all specified products.

C. SAMPLES

Samples shall be clearly labeled on the back (where possible), designating item number, name of manufacturer, sign type and location. Fabricator shall submit a minimum of two (2) samples of each color and finish applied on each material type as indicated in the drawing package. Samples should represent the final finish of each element and will be used as control samples for production approval. Samples should represent extreme variations in color and texture that might occur during fabrication. Please submit the following samples as specified in the drawing package, list project specific submittal requirements.

D. COLOR SAMPLES

Color sample(s) for each specified color, process and finish. Color submittal(s) shall be submitted on each relevant substrate specified.

E. MATERIAL SAMPLES

Material samples of each specified Material (M1, M2 etc.) in each color and finish specified. Submit manufacturer's standard color palette where required for color and finish selection.

F. CHPL SAMPLES

Custom High Pressure Laminate (CHPL) manufacturer must supply project-specific electronic PDF proofs for content approval and minimum 8" x 10" x .060" actual material lab samples for color

and finish approval from production-ready digital art work and specifications as provided by Designer.154 Philadelphia Parks and Recreation I SIGNAGE STANDARD MANUAL

G. PAPER TEMPLATES

Templates should be fully assembled or have complete registration marks for assembly. Fabricator shall provide for Designer approval, full-size paper templates for review and approval in the field of the following sign types:

PID.1, PLY.1 (FOR 2-5) AND PLY.2 (FOR 5-12), BUL1.C, AND RUL.2.

H. SIGN SAMPLES

A. Sign Contractor shall construct the following sign samples/mock-ups:

1. PLY.1 (only required by Fabricator on initial fabrication contract for this program)

1.4 REVIEW PROCESS

- A. Each reviewing party, i.e. Designer, Owner, Architect, etc. will each require a minimum of 10 business days to review all submittals. The process and sequence of submittal and review shall be discussed and agreed to during the project kickoff meeting. Designer reserves the right to reject any submittal (shop drawing, sample, etc.) that does not satisfy the requirements as outlined in this document including but not limited to: field conditions, construction, finish or color requirements. Submit additional drawings/ samples as required to obtain final approval.

1.5 WORK INCLUDED

- A. Site verification, fabrication, and delivery-of all sign types and quantities indicated in the final approved locations.
- B. Installation of signs may be completed by the Fabricator or the General Contractor. Fabricator to verify the sign quantities from the Copy List and Sign Location Plans and if discrepancies exist, notify the Designer of any such discrepancies.
- C. Work shall include all support structures and fasteners required for installation. Work shall include all design engineering needed to produce the project to comply with all applicable municipal, state and federal code, and structural soundness. Fabricator to provide all services, subcontractors, labor, materials and equipment needed to complete the work described in this design drawings and specifications document.
It is the Fabricator's responsibility to have all submittal drawings signed and sealed by a Structural Engineer.
- D. Fabricator shall visit site before construction begins and inspect each proposed sign location. Any issues or concerns shall be communicated to the Designer in writing within twenty-four (24) hours. Upon award of the bid, the selected Fabricator shall arrange a meeting with the Designer to review the scope of work.
- E. Fabricator will be responsible for providing the Designer and Owner a project schedule that outlines durations for all work including delivery dates for submittals and Designer and Owner review time. Sign Contractor shall update and reissue the schedule throughout the project and communicate all changes/impacts on the schedule to Designer and Owner.
- F. Prior to installation, the Fabricator shall conduct a pre-install walk through with the Designer and Owner to address any potential issues/questions.
- G. At the substantial completion of the project the Fabricator shall perform a walk-through with the Designer and Owner to inspect the installation and create a punch list of all unsatisfactory items. Fabricator is required to complete all punch list items within 3-4 weeks of receipt of punch list.

1.6 WORK QUALITY

- A. All work to be done in a professional manner and to the highest trade standards. Fabricator is responsible for ensuring the quality standards above for all related professional and trade subcontracted work including: general carpentry, masonry, electrical, landscaping, or utilities required for the installation of all sign types as described, unless otherwise agreed to by Owner.
- B. All subcontracted work must meet the general accepted professional standards.

1.7 REFERENCE STANDARDS

- A. The following materials reference standards will apply to the work materials (use most current version of reference standards):
 1. ASTM A36 Structural Steel
 2. ASTM A123 Zinc (Hot Galvanized) coatings on products fabricated from rod, pressed, and forged steel shape, plates and bars.
 3. ASTM B221 Aluminum-alloy extruded bars, rods, wire, shapes and tubes.
 4. ASTM D822 Light and Water exposure apparatus (Carbon-arc type) for testing paint, varnish, lacquer, and related products.
 5. ASTM E84 Surface-burning characteristics of building materials, lacquer and related products.
 6. AWI Comply with applicable requirements of "Architectural Woodwork Quality Standards" published by the Architectural Woodwork Institute.
 7. CDA Copper Development Association, Inc.
 8. FS L-P-391 Plastic sheet, rods and tubing, rigid, cast materials
 9. FS L-P-387 Plastic sheet, laminated, thermosetting
 10. PS-1 Construction and industrial plywood
 11. PEI Porcelain Enamel Institute
 12. TM 8135 QQ-B-613 (Fed Spec) Brass, Muntz 280
 13. UL-943 Fluorescent lamp ballasts quality
 14. ICC A117.1 – 2009 Accessible and Usable Buildings and Facilities

1.8 WARRANTIES

- A. Warrant all products (including, but not limited to: materials, hardware, and finishes) against any and all defects based on manufacturers' supplied warranties from date of installation. All manufacturer warranties should be submitted to the Designer and Owner for review.
 1. Vinyl die-cut letters: warranted against delimitation from substrate.
 2. Paint finishes: warranted against fading or chalking, corrosion developing beneath paint surfaces of the support systems (except for obvious vandalism or other external damage to the paint surfaces).
 3. Corrosion of the fastenings.
 4. The signs not remaining true and plumb on their supports during normal wear.
 5. Fading of the colors when matched against a sample of the original color and material.
 6. Discoloration of metal finishes.
 7. Adhesives, e.g. tape and epoxy
 8. Paneling not remaining true and plumb on their supports during normal wear.

- B. The Fabricator shall correct any and all material and/ or workmanship defects which may appear during the warranty period by restoring defective work to the standard of the contract

documents at no cost to the Owner and to the Owner's satisfaction. Corrections include but are not limited to disfiguring of any surface due to chalking, rusting, bubbling, or other disintegration of the sign face or of the messages or of the edge finish of the sign inserts or panel.

C. Manufacturer warrants that under normal wear and use the installation and signposts will not crack or fail for a period of ten (10) years from the date of substantial completion.

D. Installer shall provide labor and material warranty for a period of one (1) full year from the date of substantial completion.

1.9 CHPL PRODUCT WARRANTIES

A. Manufacturer warrants that under normal wear and use the workmanship and materials used in the CHPL product purchased from the Manufacturer will meet the standards set forth on the applicable specification materials and that the product will not delaminate, peel, blister, crack or fade for a period ten (10) full years from the date of purchase.

1. In the event that the product does not perform as warranted:

2. Manufacturer shall be allowed to conduct an on-site inspection and investigation, or be provided digital images of defects

3. Manufacturer shall work directly with the end-user to resolve any warranty matter,

4. The sole remedy will be the repair or replacement of the defective product at the sole discretion of the Manufacturer, and/ or

5. The repair or replacement by Manufacturer shall be limited to the re-manufacture and shipment of the replacement or repaired product to the site of the end-user's product.

B. This warranty only applies to the manufacture and material used in the manufacture of the product. Manufacturer shall not be liable for any other costs, including but not limited to installation, labor or other costs or expenses. Any repair or replacement shall be warranted for a period up to the remaining life of the original warranty. Further the repair or replacement costs incurred by Manufacturer shall not exceed the purchase price paid for the product.

1.10 QUALITY ASSURANCE

A. Work done and materials furnished shall meet the highest industry standards in every respect and, unless otherwise specified, materials and equipment shall be new and of the latest design.

B. The Design Intent Package should provide everything necessary for a complete contract.

C. In the event of conflict or omission, the Fabricator shall consult the Designer for resolution. All clarifications are to be made in writing in the form of an RFI from the Fabricator to the Designer.

D. Use only personnel thoroughly skilled and experienced with the products and method for fabrication and installation of signage specified.

E. The Owner shall reserve the right to reject any shop drawings, samples or other submittals, as well as any finished product or installation, that cannot meet the standard of quality established. Any such decision will be considered final and not subject to recourse.

F. Materials and hardware not specified, but necessary to the complete functioning of the sign, shall conform to the quality level established.

- G. Substitutions of items specifically indicated in this specifications package that serve the same function with equal performance will be considered upon submission of substitution. SEE DIV 1.

PART 2 - MATERIALS AND PRODUCTS

2.1 ALUMINIUM

- A. Aluminum shall be of best commercial quality and the various forms shall be straight and true. There shall be no scratches, scars or buckles. Size thickness and finish of aluminum shall be per NAAMM "Metal Finishes Manual". Comply with the following industry standards.
- B. Aluminum sheets shall conform to ASTM B209 6061-T6
- C. Aluminum extrusions shall conform to ASTM B241 6063 T6. Wall thickness shall be a minimum of 1/8" thick unless otherwise shown.
- D. Brushed Finishes-Brush with abrasive of increasing grit# in a linear directional pattern.
- E. Final surface shall have visible grain pattern to match sample approved by Designer. Spray with clear protective finish.
- F. Polished Finish-Brush with abrasive of increasing grit #. Buff to a mirror finish with no visible grain. Match sample approved by Designer. Spray with clear protective finish.
- G. Non-Directional Finish-Brush with abrasive mounted in a random orbital sander. Match sample approved by Designer. Spray with clear protective finish.

2.2 STAINLESS STEEL

- A. Structural Stainless steel shapes to be rolled or laser fused, as manufactured by Stainless Structurals, LLC. (936-538- 7600, www.stainless-structurals.com)
- B. Chromium stainless steel sheet. Use type 304 or type 316 stainless steel with 16% chromium and 10% nickel.
- C. For steel exposed to view on completion, provide materials having flat, smooth surfaces without blemishes. Do not use materials whose surfaces exhibit pitting, seam marks, roller marks, rolled trade names, or roughness. Stainless Steel Plate, Sheet and Strip: Provide stainless steel plate, sheet, or strip, AISI Type 302, complying with requirements of ASTM A 167.
- D. Stainless Steel Finishes: Finish designations prefixed by "AISI" conform to the system established by the American Iron and Steel Institute for designating finishes.
- E. Finish: Bead blasted & Pickled.

2.3 CUSTOM HIGH PRESSURE LAMINATE

- A. Provide Custom High pressure laminate as manufacturer by iZone or an approved equal.
- B. Custom High Pressure Laminate material composed of required layers of phenolic resin impregnated brown kraft filler paper to produce specified thicknesses, surfaced by a layers of

melamine overlay, graphics imaged on saturation grade paper with UV resistant pigment based process color inks, and with an optically clear UV overlay that will resist no less than 99% of all sunlight and UV rays, as well as provide a graffiti resistant surface that allows for removal with standard cleaners.

- C. Layers of material are to be assembled, and heat/ pressure consolidated at approximately 1200 PSI at temperatures exceeding 275° Fahrenheit at manufacturer's prescribed time frames.
- D. All manufacturing processes of printing, pressing, machining, finishing and crating to be accomplished within a single standalone manufacturing facility to ensure consistent quality control and providing standard product delivery times of three weeks.

2.4 WOOD

- A. #1 grade black locust lumber. Sustainably harvested. Eased edges. Apply a UV clear coat to enhance the wood grain and provide additional protection.

2.5 REFLECTIVE GRAPHICS

- A. Provide 3M Scotchlite enclosed lens reflective sheeting or approved equal.

2.6 CONCRETE

- A. All concrete footers are to be poured in place.
- B. All concrete footers are to be poured from thoroughly mixed and agitated concrete in order to prevent unreasonable voids in the finished casting.
- C. Concrete to meet specified "PSI Test" for strength: 3,500 psi minimum. Concrete to meet specified "Slump test" before pouring footing. All footings to extend past the frost line.
- D. Any footers or posts for signs will be placed in wet concrete and allowed to fully cure in place before any signage is attached or mounted to it in any way. All exposed faces of concrete shall receive a finish to match existing, adjacent surfaces.

2.7 VHB FOAM TAPES

- A. Provide 3M Scotch VHB 4930
- B. Adhesive shall be Acrylic VHB
- C. Carrier shall be closed cell foam

2.8 ACCESSORIES ANCHORS AND FASTENINGS

- A. Provide anchors and fasteners required to secure work in place. Do not expose fastenings on surface of sign panels unless specifically noted otherwise. Do not deform, distort or discolor sign face surfaces by attachment of concealed fastenings.

- B. All fastenings shall be non-corrosive and resistant to oxidation or other corrosive action, of the same composition completely through their cross sections, particularly when used below grade. Use highest quality stainless steel hardware and fasteners.
- C. Anchors, inserts or fasteners shall be compatible with sign materials, shall not result in galvanic action or chemical interaction of adhesives and shall have demonstrable and sufficient strength for intended use.
- D. Steel anchors and fastenings for exterior use shall be galvanized in accordance with ASTM A153.
- E. Fabricate and install signs with fastenings to withstand all actions imposed by use; 30 psf wind perpendicular to surfaces, water, ice, snow loads and similar forces.
- F. Anchor bolts in concrete shall be cast in place. Fabricator shall furnish instructions for the setting of anchors and bearing plates. Fabricator shall ascertain that the items are properly set during the process of the work.
- G. Secure work with fastenings of same color and finish as the components they secure where they are exposed to view, unless noted otherwise. All exposed fasteners must be vandal resistant and have vandal-proof "spanner" type slots to be removed only with a special driver head.

PART 3 - EXECUTION

3.1 PROTECTION AND STORAGE

- A. Fabricator is responsible for storage of signs and assemblies and protection from damage at the shop, in transit and until erected in place, complete, inspected and accepted by Owner.
- B. Fabricator is responsible for the replacement pilferage both prior to and until inspection and acceptance of installation by the Owner.

3.2 INSPECTION

- A. All production materials, color samples and paints, fabricated or partially fabricated items shall be available for inspection, on-site or in the shop, by the Owner or Designer during the manufacturing process and until final delivery, installation and acceptance, to determine compliance with the requirements of these specifications. Shop inspection approvals do not guarantee final acceptance of installed work.

3.2 INSTALLATION

- A. Install sign units and components with concealed fasteners unless otherwise shown. Refer to drawings for general method of installation. Verify each surface in field to determine appropriate mounting hardware. Fabricator is responsible for determining where below ground or in-wall structural tie-ins may be required. All elements should be installed true and plumb in accordance with the design intent of this document.
Fabricator is responsible for determining the location of underground structures and utilities on ground-mounted signs. Any conflicts should be brought to the attention of the Owner and Designer.
- B. Sign location drawings show approximate locations of signs. Fabricator, Designer and Owner shall conduct a pre-install mark out walk through to confirm all locations and identify areas of conflict.

3.3 REGULATORY REQUIREMENTS

- A. All installation work shall comply with applicable municipal, state and federal codes, sign ordinances and ADA guidelines for handicapped and fire/life safety signing.
- B. All OSHA safety requirements will be implemented during fabrication and installation as needed or required to comply with safety regulations.
- C. All field/site work shall be conducted in compliance with the Owner/Construction Manager's requirements/ regulations for the site, particularly areas open and accessible to the public. Work area protection shall be required as needed and all site-specific rules should be reviewed and outlined during the project kick-off meeting.

3.4 CLEAN UP

- A. Daily and upon completion of installation remove all waste, dirt, wrappings and excess materials, tools and equipment, and thoroughly clean all surfaces to the satisfaction of the Owner.

3.5 REORDERING

- A. Reordering all items specified in this package shall be available to the Owner in additional quantities for a period of 10 years after completion of all work called for in this specification.

END OF SECTION 100610

SECTION 101100 - VISUAL DISPLAY UNITS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Framed markerboards.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For visual display units.

1. Include plans, elevations, sections, details, and attachment to other work.
2. Show locations of panel joints.

C. Samples: For each type of visual display unit indicated.

D. Product Schedule: For visual display units.

1.3 INFORMATIONAL SUBMITTALS

A. Sample Warranties: For special warranties.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For visual display units to include in maintenance manuals.

1.5 WARRANTY

A. Special Warranty for Porcelain-Enamel Face Sheets: Manufacturer agrees to repair or replace porcelain-enamel face sheets that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 50 years from date of Substantial Completion, or life of the building, as standard with manufacturer.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 450 or less.

2.2 FRAMED MARKERBOARD ASSEMBLY

A. Basis-of-Design Product: Subject to compliance with requirements, provide Claridge Products and Equipment, Inc. Whiteboard with Heavy Aluminum Frames.

B. Visual Display Board Assembly: Factory fabricated.

1. Assembly: Porcelain-enamel markerboard.
2. Corners: Square.
3. Width: As indicated on Drawings.
4. Height: As indicated on Drawings.

C. Markerboard Panel: Porcelain-enamel-faced markerboard panel on core indicated.

1. Color: White.

D. Aluminum Frames and Trim: Fabricated from not less than 0.062-inch- (1.57-mm-) thick, extruded aluminum; heavy duty size and shape.

1. Aluminum Finish: Clear anodic finish.

E. Chalktray: Manufacturer's standard; continuous.

1. Type: Extruded aluminum with grooved tray and cast-aluminum end closures.

2.3 MARKERBOARD PANELS

A. Porcelain-Enamel Markerboard Panels: Balanced, high-pressure, factory-laminated markerboard assembly of three-ply construction, consisting of moisture-barrier backing, core material, and porcelain-enamel face sheet with low-gloss finish. Laminate panels under heat and pressure with manufacturer's standard, flexible waterproof adhesive.

1. Manufacturer's Standard Core: Minimum 3/8 inch (9.5 mm) thick particleboard or minimum 7/16 inch (11 mm) thick medium-density fiberboard, with manufacturer's standard moisture-barrier backing.
2. Laminating Adhesive: Manufacturer's standard moisture-resistant thermoplastic type.

2.4 MATERIALS

A. Porcelain-Enamel Face Sheet: PEI-1002, with face sheet manufacturer's standard two- or three-coat process.

B. Extruded Aluminum: ASTM B 221 (ASTM B 221M), Alloy 6063.

2.5 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install visual display surfaces in locations and at mounting heights indicated on Drawings, or if not indicated, at heights as directed by Architect. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.

B. Field-Assembled Visual Display Assemblies: Coordinate field-assembled units with grounds, trim, and accessories indicated. Join parts with a neat, precision fit.

1. Where size of visual display board assemblies or other conditions require support in addition to normal trim, provide structural supports or modify trim as indicated or as selected by Architect from manufacturer's standard structural support accessories to suit conditions indicated.

- C. Factory-Fabricated Visual Display Board Assemblies: Attach concealed clips, hangers, and grounds to wall surfaces and to visual display board assemblies with fasteners at not more than 16 inches (400 mm) o.c. Secure tops and bottoms of boards to walls.

END OF SECTION

SECTION 101200 - DISPLAY CASES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Bulletin boards.

1.2 DEFINITIONS

- A. Bulletin Board: Glazed cabinet with tackboard panel, without shelves, typically of shallow depth for display of paper documents.

1.3 ACTION SUBMITTALS

- A. Sustainable Design Submittals: Provide Sustainable Design Submittals in Accordance with Section 018113.

1. Building Product Disclosure Requirements: To encourage the use of building products that are working to minimize their environmental and health impacts, provide the following information when available:

- a. Environmental Product Declaration: Submit with Product-specific Type III or Industry-wide Type III Environmental Product Declaration (EPD).
- b. Material Ingredient Reporting: Submit Cradle to Cradle (C2C) certification (v2 Basic or v3 Bronze level), Health Product Declaration (HPD), or Declare product labels.

2. Recycled Content: The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.

3. Regional Materials: Materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles (160 km) of Project Site. If only a fraction of a product or material is extracted/harvested/recovered and manufactured locally, then only that percentage (by weight) shall contribute to the regional value.

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

- C. Shop Drawings: For bulletin boards

1. Include plans, elevations, sections, and attachment details.
2. Show location of seams and joints in tackboard panels.
3. Include sections of typical trim members.

- D. Samples: For each exposed product and for each color and texture specified; not less than 8-1/2 by 11 inches (215 by 280 mm) for tackboard panels and 6 inches (150 mm) long for trim with factory finish.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For tackboard panels, for tests performed by a qualified testing agency.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For bulletin boards to include in maintenance manuals.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain bulletin boards from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 50 or less.

2.3 BULLETIN BOARDS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Claridge Products and Equipment, Inc: Contemporary Series Bulletin Board Cabinet 2044S, or comparable product.

- B. General: Factory-fabricated unit consisting of manufacturer's standard wall-mounted cabinet with tackboard panel on back inside surface and operable glazed doors at front.

1. Frame and Cabinet Profile: Square frame section with square cabinet corners.
2. Mounting: Surface mounted
3. Size: 48"x72"

- C. Aluminum-Framed Cabinet: Extruded aluminum; with clear anodic finish.

- D. Glazed Sliding Doors: Tempered glass unframed; with extruded-aluminum top and bottom track; supported on nylon or ball-bearing rollers; with plastic top guide and rubber bumpers. Equip each door with ground finger pull and adjustable cylinder lock with two keys.

1. Thickness: Not less than 6 mm
2. Number of Doors: Two

E. Back Panel: Manufacturer's standard natural-cork tackboard panel.

1. Color: Pineapple No. 1119

2.4 MATERIALS

A. Composite Wood Products: Products shall be made using ultra-low-emitting formaldehyde resins as defined in the California Air Resources Board's "Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products" or shall be made with no added formaldehyde.

B. Hardboard: ANSI A135.4, tempered.

C. Fiberboard: ASTM C208.

D. Particleboard: ANSI A208.1, Grade M-1.

E. Hardwood Plywood: HPVA HP-1.

F. Natural-Cork Sheet: Seamless, single-layer, compressed fine-grain cork sheet; bulletin board quality; face sanded for natural finish.

G. Extruded-Aluminum Bars and Shapes: ASTM B221 (ASTM B221M), Alloy 6063.

H. Aluminum Tubing: ASTM B429/B429M, Alloy 6063.

I. Clear Tempered Glass: ASTM C1048, Kind FT, Condition A, Type I, Class 1, Quality Q3, with exposed edges seamed before tempering.

J. Fasteners: Provide screws, bolts, and other fastening devices made from same material as items being fastened, except provide hot-dip galvanized, stainless steel, or aluminum fasteners for exterior applications. Provide types, sizes, and lengths to suit installation conditions. Use security fasteners where exposed to view.

K. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.5 FABRICATION

A. Fabricate bulletin boards to requirements indicated for dimensions, design, and thickness and finish of materials.

B. Use metals and shapes of thickness and reinforcing required to produce flat surfaces, and to impart strength for size, design, and application indicated.

C. Fabricate cabinets and door frames with reinforced corners, mitered to a hairline fit, with no exposed fasteners.

D. Fabricate shelf standards plumb and at heights to align shelf brackets for level shelves.

2.6 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM/NOMMA 500 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 unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.7 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance of the Work.

B. Examine roughing-in for electrical power systems to verify actual locations of connections before installation of illuminated units.

C. Examine walls and partitions for proper backing for bulletin boards.

D. Examine walls and partitions for suitable framing depth if recessed units will be installed.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install units in locations and at mounting heights indicated on Drawings, or if not indicated, at heights indicated below. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.

1. Mounting Height: 84 inches above finished floor to top of cabinet.

B. Bulletin Boards: Attach units to wall surfaces with concealed clips, hangers, or grounds.

3.3 ADJUSTING AND CLEANING

- A. Adjust doors to operate smoothly without warp or bind and so contact points meet accurately. Lubricate operating hardware as recommended in writing by manufacturer.
- B. Touch up factory-applied finishes to restore damaged areas.

END OF SECTION

SECTION 101400 - SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Panel signs for room identification
 - 2. Field-applied, vinyl-character signs.
- B. Related Requirements:
 - 1. Section 101419 - Dimensional Letter Signage for cut out dimensional character signage at the building exterior.

1.2 ALLOWANCES

- A. Allowances for graphic signage are specified in Section 012100 "Allowances."

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show fabrication and installation details for signs.
 - 1. Provide message list, typestyles, graphic elements, and layout for each sign.
- C. Samples for Initial Selection: Manufacturer's color charts consisting of actual units or sections of units showing the full range of colors available for the following:
 - 1. Acrylic sheet.
- D. Samples for Verification: For each of the following products and for the full range of color, texture, and sign material indicated, of sizes indicated:
 - 1. Acrylic Sheet: 8 by 10 inches (200 by 250 mm) for each color required.
 - 2. Panel Signs: Not less than 6 inches (305 mm) square.
- E. Sign Schedule: Use same designations indicated on Drawings.

1.4 COORDINATION

- A. Coordinate placement of anchorage devices with templates for installing signs.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Acrylic Sheet: ASTM D 4802, Category A-1 (cell-cast sheet), Type UVA (UV absorbing).

2.2 PANEL SIGNS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. ASI-Modulex, Inc.
 2. Best Sign Systems Inc.
 3. Grimco, Inc.
 4. Innerface Sign Systems, Inc.
 5. InPro Corporation
 6. Mills Manufacturing Company.
 7. Mohawk Sign Systems.
 8. Seton Identification Products.
 9. Signature Signs, Incorporated.
- B. Interior Panel Signs: Provide smooth sign panel surfaces constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch (1.5 mm) measured diagonally from corner to corner, complying with the following requirements:
1. Acrylic Sheet: 0.060 inch thick.
 2. Edge Condition: Square cut.
 3. Corner Condition: Square.
 4. Mounting: Unframed.
 - a. Manufacturer's tamper proof anchors for substrates encountered.
 5. Custom Paint Colors: Match Pantone color matching system.
 6. Color: As selected by Architect from manufacturer's full range.
- C. Panel Sign Schedule:
1. Sign Type: Room Sign:
 - a. Sign Size: As indicated on drawings.
 - b. Message Panel Material: Cast Acrylic.
 - c. Message Panel Finish/Color: As selected from manufacturer's full range.
 - d. Background Finish/Color: As selected from manufacturer's full range.
 - e. Character Size: As indicated on drawings.
 - f. Character Finish/Color: As selected from manufacturer's full range.
 - g. Text/Message: As indicated on drawings.
 - h. Location: Classroom and Multipurpose Room interior doors.

2.3 FIELD-APPLIED, VINYL-CHARACTER SIGNS

- A. Field-Applied, Vinyl-Character Sign: Prespaced characters die cut from **3- to 3.5-mil (0.076- to 0.089-mm)** thick, weather-resistant vinyl film with release liner on the back and carrier film on the front for on-site alignment and application.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. APCO Graphics, Inc.
 - b. Allen Markings.
 - c. Mohawk Sign Systems.
 - d. Seton Identification Products; a Brady Corporation company.

e. inpro Corporation.

2. Size: As indicated on Drawings.
3. Substrate: As indicated on Drawings.
4. Text and Font: As indicated on Drawings.

2.4 ACCESSORIES

- A. Anchors and Inserts: Provide nonferrous-metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion-bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

2.5 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.

2.6 ACRYLIC SHEET FINISHES

- A. Colored Coatings for Acrylic Sheet: For copy and background colors, provide colored coatings, including inks, dyes, and paints, that are recommended by acrylic manufacturers for optimum adherence to acrylic surface and that are UV and water resistant for five years for application intended.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
- B. Verify that items, including anchor inserts, are sized and located to accommodate signs.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Locate signs and accessories where indicated, using mounting methods of types described and complying with manufacturer's written instructions.
 1. Install signs level, plumb, and at heights indicated, with sign surfaces free of distortion and other defects in appearance.
 2. Interior Wall Signs: Install signs on walls adjacent to latch side of door where applicable. Where not indicated or possible, such as double doors, install signs on nearest adjacent walls. Locate to

allow approach within 3 inches of sign without encountering protruding objects or standing within swing of door.

- B. Wall-Mounted Signs: Comply with sign manufacturer's written instructions except where more stringent requirements apply.
 - 1. Mechanical Fasteners: Use nonremovable mechanical fasteners placed through predrilled holes. Attach signs with fasteners and anchors suitable for secure attachment to substrate as recommended in writing by sign manufacturer
- C. Shop- and Subsurface-Applied Vinyl: Align vinyl film in final position and apply to surface. Firmly press film from the middle outward to obtain good bond without blisters or fishmouths.

3.3 GENERAL FINISH REQUIREMENTS

- A. 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.

3.4 CLEANING AND PROTECTION

- A. After installation, clean soiled sign surfaces according to manufacturer's written instructions. Protect signs from damage until acceptance by Owner.

END OF SECTION

SECTION 101419 - DIMENSIONAL CHARACTER SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Exterior Cutout dimensional characters.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For dimensional letter signs.
 - 1. Include fabrication and installation details and attachments to other work.
 - 2. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
 - 3. Show message list, typestyles, graphic elements, and layout for each sign at least half size.
- C. Samples: For each exposed product and for each color and texture specified.

1.3 INFORMATIONAL SUBMITTALS

- A. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.5 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 DIMENSIONAL CHARACTERS

- A. Cutout Characters: Characters with uniform faces; square-cut, smooth edges; precisely formed lines and profiles; and as follows:
 - 1. Character Material: Sheet or plate stainless steel.
 - 2. Character Height: As indicated.
 - 3. Thickness: 0.25 inch
 - 4. Finishes:
 - a. Integral Stainless-Steel Finish: No. 04 Finish.
 - 5. Mounting: Countersunk, tamper-resistant flathead through fasteners

2.2 DIMENSIONAL CHARACTER MATERIALS

- A. Stainless-Steel Sheet: Type 304.

2.3 ACCESSORIES

- A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signage, noncorrosive and compatible with each material joined, and complying with the following:
1. Use concealed fasteners and anchors unless indicated to be exposed.
 2. For exterior exposure, furnish stainless-steel devices unless otherwise indicated.
 3. Exposed Metal-Fastener Components, General:
 - a. Fabricated from same basic metal and finish of fastened metal unless otherwise indicated.
 4. Sign Mounting Fasteners:
 - a. Through Fasteners: Exposed metal fasteners matching sign finish, with type of head indicated, installed in predrilled holes.

2.4 FABRICATION

- A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.
1. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
 2. Provide welds behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded connections of flux, and dress exposed and contact surfaces.
 3. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
 4. Internally brace signs for stability and for securing fasteners.
 5. Provide rebates, lugs, and brackets necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.

2.5 STAINLESS STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
1. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
 2. Directional Satin Finish: No. 4.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.
1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
 2. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
- B. Mounting Methods:

1. Through Fasteners: Drill holes in substrate using predrilled holes in sign as template. Countersink holes in sign if required. Place sign in position and flush to surface. Install through fasteners and tighten.

C. Remove temporary protective coverings and strippable films as signs are installed.

END OF SECTION

SECTION 102113 – PLASTIC TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid-plastic toilet compartments configured as toilet enclosures and urinal screens.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for supports that attach floor-and-ceiling-anchored compartments and post-to-ceiling screens to overhead structural system.
2. Section 102800 "Toilet Room Accessories" for toilet tissue dispensers, grab bars, and similar accessories mounted on toilet compartments.

1.2 ACTION SUBMITTALS

A. Sustainable Design Submittals: Provide Sustainable Design Submittals in Accordance with Section 018113.

1. Building Product Disclosure Requirements: To encourage the use of building products that are working to minimize their environmental and health impacts, provide the following information when available:
 - a. Environmental Product Declaration: Submit with Product-specific Type III or Industry-wide Type III Environmental Product Declaration (EPD).
 - b. Material Ingredient Reporting: Submit Cradle to Cradle (C2C) certification (v2 Basic or v3 Bronze level), Health Product Declaration (HPD), or Declare product labels.
2. Recycled Content: The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.
3. Regional Materials: Materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles (160 km) of Project Site. If only a fraction of a product or material is extracted/harvested/recovered and manufactured locally, then only that percentage (by weight) shall contribute to the regional value.

B. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for toilet compartments.

C. Shop Drawings: For toilet compartments.

1. Include plans, elevations, sections, details, and attachment details.
2. Show locations of cutouts for compartment-mounted toilet accessories.
3. Show locations of centerlines of toilet fixtures.
4. Show locations of floor drains.
5. Show ceiling-mounted items, and overhead support or bracing locations.

D. Samples for Initial Selection: For each type of toilet compartment material indicated.

1. Include Samples of hardware and accessories involving material and color selection.
- E. Samples for Verification: For the following products, in manufacturer's standard sizes unless otherwise indicated:
1. Each type of material, color, and finish required for toilet compartments, prepared on 6-inch-square Samples of same thickness and material indicated for Work.
 2. Each type of hardware and accessory.
- F. Product Schedule: For toilet compartments, prepared by or under the supervision of supplier, detailing location and selected colors for toilet compartment material.

1.3 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of toilet compartment.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For toilet compartments to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents and source.
1. Door Hinges: two (2) hinges with associated fasteners.
 2. Latch and Keeper: Ten (10) latches and keepers with associated fasteners.
 3. Door Bumper: Ten (10) bumpers with associated fasteners.
 4. Door Pull: Four (4) door pulls with associated fasteners.
 5. Fasteners: Twenty (20) fasteners of each size and type.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 Basis-of-Design: Bradley Corporation Bradmar solid plastic partitions and doors, or from the following manufacturers:

- A. Santana Products Co.
- B. Bobrick Washroom Equipment, Inc.

2.2 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1. Flame-Spread Index: **75** or less.

2. Smoke-Developed Index: 450 or less.

B. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1 for toilet compartments designated as accessible.

2.3 SOLID-PLASTIC TOILET COMPARTMENTS

A. Toilet-Enclosure Style: Floor and ceiling anchored.

B. Entrance-Screen Style: Floor and ceiling anchored.

C. Urinal-Screen Style: Post to ceiling.

D. Door, Panel, Screen, and Pilaster Construction: Solid, high-density polyethylene (HDPE) panel material, not less than 1 inch thick, seamless, with eased edges, no-sightline system, and with homogenous color and pattern throughout thickness of material.

1. Integral Hinges: Configure doors and pilasters to receive integral hinges.

2. Heat-Sink Strip: Manufacturer's standard continuous, stainless-steel strip fastened to exposed bottom edges of solid-plastic components to hinder malicious combustion.

3. Color and Pattern: One color and pattern in each room as selected by Architect from manufacturer's full range

E. Pilaster Shoes and Sleeves (Caps): Manufacturer's standard design; stainless steel.

F. Urinal-Screen Post: Manufacturer's standard post design of material matching the thickness and construction of pilasters; with shoe and sleeve (cap) matching that on the pilaster.

G. Brackets (Fittings):

1. Stirrup Type: Ear or U-brackets, stainless steel

2. Full-Height (Continuous) Type: Manufacturer's standard design; stainless steel.

2.4 HARDWARE AND ACCESSORIES

A. Hardware and Accessories: Manufacturer's heavy-duty operating hardware and accessories.

1. Hinges: Manufacturer's minimum 0.062-inch-thick stainless-steel continuous, cam type that swings to a partially open position, allowing emergency access by lifting door. Mount with through-bolts.

2. Latch and Keeper: Manufacturer's heavy-duty surface-mounted cast-stainless-steel latch unit designed to resist damage due to slamming, with combination rubber-faced door strike and keeper, and with provision for emergency access. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible. Mount with through-bolts.

3. Coat Hook: Manufacturer's heavy-duty combination cast-stainless-steel hook and rubber-tipped bumper, sized to prevent in-swinging door from hitting compartment-mounted accessories. Mount with through-bolts.

4. Door Bumper: Manufacturer's heavy-duty rubber-tipped cast-stainless-steel bumper at out-swinging doors. Mount with through-bolts.

5. Door Pull: Manufacturer's heavy-duty cast-stainless-steel pull at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible. Mount with through-bolts.

- B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.
- C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless-steel, hot-dip galvanized-steel, or other rust-resistant, protective-coated steel compatible with related materials.

2.5 MATERIALS

- A. Aluminum Castings: ASTM B 26/B 26M.
- B. Aluminum Extrusions: ASTM B 221.
- C. Brass Castings: ASTM B 584.
- D. Brass Extrusions: ASTM B 455.
- E. Stainless-Steel Sheet: ASTM A 666, Type 304, stretcher-leveled standard of flatness.
- F. Stainless-Steel Castings: ASTM A 743/A 743M.
- G. Zamac: ASTM B 86, commercial zinc-alloy die castings.

2.6 FABRICATION

- A. Fabrication, General: Fabricate toilet compartment components to sizes indicated. Coordinate requirements and provide cutouts for through-partition toilet accessories where required for attachment of toilet accessories.
- B. Floor-and-Ceiling-Anchored Units: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment nuts at tops and bottoms of pilasters. Provide shoes and sleeves (caps) at pilasters to conceal anchorage.
- C. Urinal-Screen Posts: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment nuts at tops and bottoms of posts. Provide shoes and sleeves (caps) at posts to conceal anchorage.
- D. Door Size and Swings: Unless otherwise indicated, provide 24-inch-wide, in-swinging doors for standard toilet compartments and 36-inch-wide, out-swinging doors with a minimum 32-inch-wide, clear opening for compartments designated as accessible.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for fastening, support, alignment, operating clearances, and other conditions affecting performance of the Work.
 - 1. Confirm location and adequacy of blocking and supports required for installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.
 - 1. Maximum Clearances:
 - a. Pilasters and Panels: 1/2 inch.
 - b. Panels and Walls: 1 inch.
 - 2. Stirrup Brackets: Secure panels to walls and to pilasters with no fewer than three brackets attached at midpoint and near top and bottom of panel.
 - a. Locate wall brackets so holes for wall anchors occur in masonry or tile joints.
 - b. Align brackets at pilasters with brackets at walls.
 - 3. Full-Height (Continuous) Brackets: Secure panels to walls and to pilasters with full-height brackets.
 - a. Locate bracket fasteners so holes for wall anchors occur in masonry or tile joints.
 - b. Align brackets at pilasters with brackets at walls.
- B. Floor-and-Ceiling-Anchored Units: Set pilasters with anchors penetrating not less than 2 inches into structural floor unless otherwise indicated in manufacturer's written instructions. Secure pilasters to supporting construction and level, plumb, and tighten. Hang doors and adjust so doors are level and aligned with panels when doors are in closed position.
- C. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.

3.3 ADJUSTING

- A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

END OF SECTION

SECTION 102213 - WIRE MESH PARTITIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Wire mesh partition systems.
 - 2. Swing doors in wire mesh partitions.
- B. Related Requirements:
 - 1. Section 087100 "Door Hardware" for swing door hardware not specified in this Section.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. Indicate clearances required for operable components.
- C. Samples: For units with factory-applied color finishes.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide products by Cogan Wire and Metal Products Ltd, or comparable product by one of the following:
 - 1. Acorn Wire & Iron Works, Inc.
 - 2. G-S Company (The).
 - 3. Indiana Wire Products, Inc.
 - 4. Miller Wire Works, Inc.
 - 5. Wire Crafters, LLC.

2.2 MATERIALS

- A. Steel Wire: ASTM A 510 (ASTM A 510M).
- B. Steel Plates, Channels, Angles, and Bars: ASTM A 36/A 36M.
- C. Steel Sheet: Cold-rolled steel sheet, ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.
- D. Steel Tubing: ASTM A 500/A 500M, cold-formed structural-steel tubing or ASTM A 513, Type 5, mandrel-drawn mechanical tubing.

2.3 WIRE MESH PARTITIONS

- A. Mesh: 0.135-inch (3.5-mm) diameter, 10 gauge intermediate-crimp steel wire woven into 2-inch mesh.

- B. Panel Framing: 1-1/4-by-1-1/4-by 12 gauge cold steel angles with corners notched and seam welded.
- C. Posts: 2-by-2-inch square steel tube; with 6-by-6-inch by 1/4-inch thick welded base plate.
- D. Swinging Doors: Fabricated from same mesh as partitions, with framing fabricated from 1-1/4-by-1/2-by-1/8-inch (32-by-13-by-3.2-mm) steel channels or 1-1/4-by-5/8-by-0.080-inch (32-by-16-by-2.0-mm) cold-rolled, C-shaped steel channels, banded with 1-1/4-by-1/8-inch (32-by-3.2-mm) flat steel bar cover plates on four sides, and with 1/8-inch- (3.2-mm-) thick angle strike bar and cover on strike jamb.
 - 1. Hinges: Full-surface type, 3-by-3-inch (76-by-76-mm) steel, three per door; bolted, riveted, or welded to door and jamb framing.
 - 2. Exit Devices, Trim, and Closer at Stair Doors: Specified in Section 087100 "Door Hardware."
 - 3. Hardware Panel: Provide solid metal midrail panel full width of door to accommodate exit hardware and associated trim.
- E. Accessories:
 - 1. Adjustable Filler Panels: 0.060-inch- (1.5-mm-) thick steel sheet, capable of filling openings from 2 to 12 inches (50 to 300 mm).
- F. Finish: Powder-coated finish unless otherwise indicated.
 - 1. Color: As selected by Architect from manufacturer's full range.

2.4 FABRICATION

- A. General: Fabricate wire mesh items from components of sizes not less than those indicated. Use larger-sized components as recommended by wire mesh item manufacturer. Furnish bolts, hardware, and accessories required for complete installation with manufacturer's standard finishes.
 - 1. Fabricate wire mesh items to be readily disassembled.
 - 2. Welding: Weld corner joints of framing and grind smooth, leaving no evidence of joint.
- B. Wire Mesh Partitions: Fabricate wire mesh partitions with cutouts for pipes, ducts, beams, and other items indicated. Finish edges of cutouts to provide a neat, protective edge.
 - 1. Mesh: Securely clinch or weld mesh to framing.
 - 2. Framing: Fabricate framing with mortise and tenon corner construction.
 - a. Provide horizontal stiffeners as indicated or, if not indicated, as required by panel height and as recommended by wire mesh partition manufacturer. Weld horizontal stiffeners to vertical framing.
 - 3. Fabricate wire mesh partitions with 3 to 4 inches (75 to 100 mm) of clear space between finished floor and bottom horizontal framing.
 - 4. Doors: Align bottom of door with bottom of adjacent panels.
 - a. For doors that do not extend full height of partition, provide transom over door, fabricated from same mesh and framing as partition panels.
 - 5. Hardware Preparation: Mortise, reinforce, drill, and tap doors and framing as required to install hardware.

2.5 STEEL AND IRON FINISHES

- A. Powder-Coat Finish: Immediately after cleaning and pretreating, apply manufacturer's standard baked-on powder-coat finish, suitable for use indicated, with a minimum dry film thickness of 2 mils (0.05 mm).

PART 3 - EXECUTION

3.1 WIRE MESH PARTITIONS ERECTION

- A. Provide line posts at locations indicated or as recommended by manufacturer.
- B. Install doors complete with door hardware.

3.2 ADJUSTING AND CLEANING

- A. Adjust doors to operate smoothly and easily, without binding or warping. Adjust hardware to function smoothly. Confirm that latches and locks engage accurately and securely without forcing or binding.
- B. 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.

END OF SECTION

SECTION 102226 - OPERABLE PARTITIONS

PART 1 – GENERAL

1.2 SUMMARY

A. This Section includes the following:

1. Manually operated, paired panel operable partitions.

B. Related Sections include the following:

1. Section 055000 “Metal Fabrications” for miscellaneous steel supports required.
3. Section 061053 “Rough Carpentry” for wood framing and supports, and all blocking at head and jambs as required.
4. Section 092900 “Gypsum Board” for wall and ceiling acoustical enclosure at head and jambs.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is certified by the operable partition manufacturer, as qualified to install the manufacturer’s partition systems for work similar in material, design, and extent to that indicated for this Project.

B. Acoustical Performance: Test operable partitions in an independent acoustical laboratory in accordance with ASTM E90 test procedure to attain no less than the STC rating specified. Provide a complete and unedited written test report upon request.

C. Preparation of the opening shall conform to the criteria set forth per ASTM E557 *Standard Practice for Architectural Application and Installation of Operable Partitions*.

1.4 ACTION SUBMITTALS

A. Sustainable Design Submittals: Provide Sustainable Design Submittals in Accordance with Section 018113.

1. Building Product Disclosure Requirements: To encourage the use of building products that are working to minimize their environmental and health impacts, provide the following information when available:

- a. Environmental Product Declaration: Submit with Product-specific Type III or Industry-wide Type III Environmental Product Declaration (EPD).
- b. Material Ingredient Reporting: Submit Cradle to Cradle (C2C) certification (v2 Basic or v3 Bronze level), Health Product Declaration (HPD), or Declare product labels.

2. Recycled Content: The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.

3. Regional Materials: Materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles (160 km) of Project Site. If only a fraction of a product or material is extracted/harvested/recovered and manufactured locally, then only that percentage (by weight) shall contribute to the regional value.

- B. Product Data: Material descriptions, construction details, finishes, installation details, and operating instructions for each type of operable partition, component, and accessory specified.
- C. Shop Drawings: Show location and extent of operable partitions. Include plans, elevations, sections, details, attachments to other construction, and accessories. Indicate dimensions, weights, conditions at openings, and at storage areas, and required installation, storage, and operating clearances. Indicate location and installation requirements for hardware and track, including floor tolerances required and direction of travel. Indicate blocking to be provided by others.
- D. Samples: Color samples demonstrating full range of finishes available by architect. Verification samples will be available in same thickness and material indicated for the work.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Clearly mark packages and panels with numbering systems used on Shop Drawings. Do not use permanent markings on panels.
- B. Protect panels during delivery, storage, and handling to comply with manufacturer's direction and as required to prevent damage.

1.6 WARRANTY

- A. Provide written warranty by manufacturer of operable partitions agreeing to repair or replace any components with manufacturing defects.
- B. Warranty period: Two (2) years.

PART 2 – PRODUCTS

2.1 MANUFACTURERS, PRODUCTS, AND OPERATION

- A. Manufacturers: Subject to compliance with requirements, provide product by the following:
 - 1. Modernfold, Inc.
- B. Products: Subject to compliance with the requirements, provide the following product:
 - 1. Acousti-Seal Legacy Series 932 manually operated paired panel operable partition

2.2 OPERATION

- A. Manually operated, top supported with retractable floor seals
- B. Final Closure: Horizontally expanding panel edge with removable crank.

2.3 PANEL CONSTRUCTION

- A. Nominal 3-inch (76mm) thick panels in manufacturer's standard 48-inch (1220mm) widths. All panel horizontal and vertical framing members fabricated from minimum 16-gage formed steel with overlapped and welded corners for rigidity. Top channel is reinforced to support suspension system com

ponents. Frame is designed so that full vertical edges of panels are of formed steel and provide concealed protection of the edges of the panel skin.

B. Panel Skin shall be 21 gage steel;

1. 50 STC

C. Hinges for Closure Panels, Pass Doors, and Pocket Doors shall be:

1. Full leaf butt hinges, attached directly to panel frame with welded hinge anchor plates within panel to further support hinge mounting to frame. Lifetime warranty on hinges. Hinges mounted into panel edge or vertical astragal are not acceptable.

D. Panel Trim: No vertical trim required or allowed on edges of panels; minimal groove appearance at panel joints.

E. Panel Weights: Steel Skin

1. 50 STC – 8 lbs./square foot

2.4 PANEL FINISHES

A. Panel face finish: Full height steel markerboard work surface

B. Panel trim: Exposed panel trim of one consistent color from manufacturer's standard offering.

1. Color: Dark Bronze

2.5 SOUND SEALS

A. Vertical Interlocking Sound Seals between panels: Roll-formed steel astragals, with reversible tongue and groove configuration in each panel edge for universal panel operation. Rigid plastic astragals or astragals in only one panel edge are not acceptable.

B. Horizontal Top Seals: Continuous contact extruded vinyl bulb shape with pairs of non-contacting vinyl fingers to prevent distortion without the need for mechanically operated parts.

C. Horizontal Bottom Seals: Manually activated bottom seals with self-contained handle providing nominal 2-inch (51mm) operating clearance with an operating range of +1/2-inch (13mm) to -1-1/2 inch (38mm). Seal shall be operable from panel edge or face.

2.6 SUSPENSION SYSTEM

A. Suspension System

1. Suspension Tracks: Minimum 11-gage, 0.12-inch (3 mm) roll-formed steel track, suitable for either direct mounting to a wood header or supported by adjustable steel hanger brackets, supporting the load-bearing surface of the track, connected to structural support by pairs of 3/8-inch (9.5mm) diameter threaded rods. Aluminum track is not acceptable.

a. Exposed track soffit: Steel, integral to track, and pre-painted white.

2. Carriers: One all-steel trolley with steel-tired ball bearing wheels per panel (except hinged panels).

2.7 OPTIONS

- A. Work Surface: Inset Dry-Erase writing surface with inset eraser pocket

PART 3 – EXECUTION

3.1 INSTALLATION

- A. General: Comply with ASTM E557, operable partition manufacturer's written installation instructions, Drawings and approved Shop Drawings.
- B. Install operable partitions and accessories after other finishing operations, including painting have been completed.
- C. Match operable partitions by installing panels from marked packages in numbered sequence indicated on Shop Drawings.
- D. Broken, cracked, chipped, deformed or unmatched panels are not acceptable.

3.2 CLEANING AND PROTECTION

- A. Clean partition surfaces upon completing installation of operable partitions to remove dust, dirt, adhesives, and other foreign materials according to manufacturer's written instructions.
- B. Provide final protection and maintain conditions in a manner acceptable to the manufacturer and installer that ensure operable partitions are without damage or deterioration at time of Substantial Completion.

3.3 ADJUSTING

- A. Adjust operable partitions to operate smoothly, easily, and quietly, free from binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Lubricate hardware and other moving parts.

3.4 EXAMINATION

- A. Examine flooring, structural support, and opening, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of operable partitions. Proceed with installation only after unsatisfactory conditions have been corrected.

3.5 DEMONSTRATION

- A. Demonstrate proper operation and maintenance procedures to Owner's representative.
- B. Provide Operation and Maintenance Manual to Owner's representative.

END OF SECTION

SECTION 102800 – TOILET ROOM ACCESSORIES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Washroom accessories.
 - 2. Warm-air dryers.
 - 3. Childcare accessories.
 - 4. Underlavatory guards.
 - 5. Custodial accessories.
- B. Related Requirements:
 - 1. Section 088300 "Mirrors" for frameless mirrors.
 - 2. Section 102113 Plastic Toilet Compartments for mounting surfaces for accessories.

1.3 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Coordinate the work of this Section with the placement of internal wall reinforcement to receive inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
 - 2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
 - 3. Include electrical characteristics.
- B. Samples: Full size, for each exposed product and for each finish specified.
 - 1. Approved full-size Samples will be returned and may be used in the Work.
- C. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
 - 1. Identify locations using room designations indicated.
 - 2. Identify accessories using designations indicated.

1.5 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For manufacturer's special warranty.

1.6 CLOSEOUT SUBMITTALS

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

1.7 WARRANTY

- A. Manufacturer's Special Warranty for Mirrors: Manufacturer agrees to repair or replace mirrors that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, visible silver spoilage defects.
 - 2. Warranty Period: 15 years from date of Substantial Completion.

PART 2 – PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 WASHROOM ACCESSORIES

- A. Source Limitations: Obtain public-use washroom accessories from single source from single manufacturer.

- B. Manufacturers:

- 1. Bradley Corp., Menomonee Falls WI, 53051
 - 2. Bobrick Washroom Equipment, Inc., Clifton Park, New York.
 - 3. TrueBro Inc., Ellington, CT 06029

- C. Toilet Tissue Dispenser (TA-1):

- 1. Bradley, one per Toilet Compartment.
 - 2. Description: Unit with double-roll toilet tissue dispenser.
 - 3. Mounting: Partition mounted, dual access with two tissue rolls per compartment or Partition mounted, dual access with two tissue rolls per compartment and with one side that mounts flush with partition of accessible compartment.
 - 4. Toilet Tissue Dispenser Capacity: 4-1/2- or 5-inch-diameter tissue rolls.
 - 5. Toilet Tissue Dispenser Operation: Controlled delivery with theft-resistant spindles.
 - 6. Material and Finish: Stainless steel, No. 4 finish (satin) 18 gage.
 - 7. Lockset: Tumbler type.

- D. Waste Receptacle (TA-2):

- 1. Bradley
 - 2. Mounting: Open top, Semi-recessed
 - 3. Minimum Capacity: 4 Gallon (15 Liter)
 - 4. Material and Finish: Stainless steel, No. 4 finish (satin) 18 gage.
 - 5. Liner: Reusable vinyl liner.
 - 6. Lockset: Tumbler type for waste receptacle.

E. Liquid-Soap Dispenser (TA-3):

1. Bradley
2. Description: Designed for dispensing soap in liquid form. 3.
4. Mounting: Horizontally oriented, surface mounted. 5.

6. Capacity: Min 12 oz.
7. Materials: Stainless Steel. Retain "Lockset" and "Refill Indicator" subparagraphs below if required.
8. Lockset: Tumbler type.
9. Refill Indicator: Window type.

F. Grab Bar (TA-4):

1. Bradley models 8122-00142 and 8122-00136
2. Mounting: Flanges with concealed fasteners.
3. Material: Stainless steel, 0.05 inch thick.
 - a. Finish: Smooth, No. 4 finish (satin) on ends and slip-resistant texture in grip area.
4. Outside Diameter: 1-1/2 inches.
5. Configuration and Length: As indicated on Drawings, Straight, 36 inches long and Straight 48 inches long.

G. Towel Pin (TA-5):

1. Bobrick Model No. B-677
2. Description: Projecting minimum of 3 3/8 inches from mounting surface. 2x2 inch flange.
3. Material and Finish: Stainless steel, No. 4 finish (satin) One per Restroom and one per Toilet Compartment.

H. Mirror Unit (TA-6):

1. Bradley 7481
2. Framed Stainless Steel security mirror: fabricated of 20 gage type 430 stainless steel, bright annealed. Stretcher leveled for uniform finish. Reflective surface is bright and smooth with a mirror like finish after being polished to a #8 architectural finish. One unit for each standard lavatory except Staff Toilet Room.
3. Frame: Stainless-steel channel.
 - a. Corners: Welded and ground smooth.
4. Hangers: Produce rigid, tamper- and theft-resistant installation, using method indicated below.
 - a. Wall bracket of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.
5. Size: 24x36 inches.

2.3 WARM-AIR DRYERS

A. Source Limitations: Obtain warm-air dryers from single source from single manufacturer. One per two lavatories in Public Use Washrooms and one per Single User Bathroom including Staff Bathrooms.

B. Multiple Airflow Warm-Air Dryer (TA-7):

1. Dyson.
2. Description: Multiple airflow warm-air hand dryer, using two or more airstreams for rapid hand drying.
3. Mounting: Surface mounted, with low-profile design.
4. Operation: Electronic-sensor activated with operation time of 10 seconds.
5. Cover Material and Finish: Stainless steel, No. 4 finish (satin).

6. Electrical Requirements: 115 V, 15 A, 1725 W.

2.4 CHILDCARE ACCESSORIES

- A. Source Limitations: Obtain childcare accessories from single source from single manufacturer.
- B. Diaper-Changing Station (TA-8):
 1. KoalaKare. Model KB200-05SS
 2. Description: Horizontal unit that opens by folding down from stored position and with child- protection strap.
 - a. Engineered to support minimum of 250-lb static load when opened.
 3. Mounting: Surface mounted, with unit projecting not more than 4 inches from wall when closed.
 4. Operation: By pneumatic shock-absorbing mechanism.
 5. Material and Finish: [Stainless steel, No. 4 finish (satin), exterior shell with rounded plastic corners; HDPE interior in manufacturer's standard color.
 6. Liner Dispenser: Built in.

2.5 UNDERLAVATORY GUARDS

- A. Underlavatory Guard :
 1. TruBro
 2. Description: Insulating pipe covering for supply and drain piping assemblies that prevents direct contact with and burns from piping; allow service access without removing coverings.
 3. Material and Finish: Antimicrobial, molded plastic, white.

2.6 CUSTODIAL ACCESSORIES

- A. Source Limitations: Obtain custodial accessories from single source from single manufacturer.
- B. Utility Shelf:
 1. Bobrick
 2. Description: With exposed edges turned down not less than 1/2 inch and supported by two triangular brackets welded to shelf underside.
 3. Size: 16 inches long by 6 inches deep
 4. Material and Finish: Not less than nominal 0.05-inch-thick stainless steel, No. 4 finish (satin).
- C. Mop and Broom Holder:
 1. Bobrick
 2. Description: Unit with shelf, hooks, holders, and rod suspended beneath shelf.
 3. Length: 36 inches.
 4. Hooks: Four (4).
 5. Mop/Broom Holders: Three (3), spring-loaded, rubber hat, cam type.
 6. Material and Finish: Stainless steel, No. 4 finish (satin).
 - a. Shelf: Not less than nominal 0.05-inch-thick stainless steel.
 - b. Rod: Approximately 1/4-inch-diameter stainless steel.

2.7 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch minimum nominal thickness unless otherwise indicated.
- B. Brass: ASTM B 19, flat products; ASTM B 16/B 16M, rods, shapes, forgings, and flat products with finished edges; or ASTM B 30, castings.
- C. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.036-inch minimum nominal thickness.
- D. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 hot-dip zinc coating.
- E. Galvanized-Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.
- F. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.
- G. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).
- H. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

2.8 FABRICATION

- A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.
- B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of 6 keys to Owner's representative.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to ASTM F 446.

3.2 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.
- B. Remove temporary labels and protective coatings.
- C. Clean and polish exposed surfaces according to manufacturer's written instructions.

END OF SECTION

SECTION 104313 - DEFIBRILLATOR CABINETS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Defibrillator cabinets to house Owner-furnished AED units.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For defibrillator cabinets.
- C. Samples: For each type of exposed finish required.

1.3 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For defibrillator cabinets to include in maintenance manuals.

1.4 COORDINATION

- A. Coordinate size of defibrillator cabinets to ensure that AED units are accommodated.
- B. Coordinate sizes and locations of defibrillator cabinets with wall depths.

PART 2 - PRODUCTS

2.1 DEFIBRILLATOR CABINET AED

- A. Basis-of-Design Product: Subject to compliance with requirements, provide JL Industries, Inc., a division of the Activar Construction Products Group; 1400 Lifestart™ Series, Model 1425 with SAF-T-LOK™.
- B. Cabinet Material: Cold-rolled steel sheet.
- C. Semi-Recessed Cabinet:
 - 1. Exposed Flat Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).
- D. Cabinet Door and Trim Material: Steel sheet.
- E. Door Style: V17 – Vertical Duo
- F. Door Glazing: Clear tempered float glass.
- G. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
- H. Accessories:

1. Alarm: Manufacturer's standard 85 dB Commander audible alarm that actuates when defibrillator cabinet door is opened and that is powered by batteries.
2. Door Lock: Cam lock that allows door to be opened during emergency by pulling sharply on door handle.
3. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as directed by Architect.
 - a. Identify defibrillator cabinet with standard graphics and wall sign.

I. Materials:

1. Cold-Rolled Steel: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.
 - a. Finish: Baked enamel or powder coat.
 - b. Color: White.
2. Tempered Float Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 3 mm thick, Class 1 (clear).

2.2 FABRICATION

- A. Defibrillator Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Prepare recesses for recessed defibrillator cabinets as required by type and size of cabinet and trim style.
- B. Install defibrillator cabinets in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction and as directed by Architect.
- C. Defibrillator Cabinets: Fasten cabinets to structure, square and plumb.
- D. Adjust defibrillator cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

END OF SECTION

SECTION 104413 - FIRE PROTECTION CABINETS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Fire-protection cabinets for portable fire extinguishers.
 - 1. Semi-Recessed for installation into new interior masonry and GWB walls with all code required signage and where indicated on drawings;
 - 2. Surface Mounted for installation onto interior masonry walls with all code required signage and where indicated on drawings.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For fire-protection cabinets.
- C. Samples: For each type of exposed finish required.

1.3 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For fire-protection cabinets to include in maintenance manuals.

1.4 COORDINATION

- A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.
- B. Coordinate sizes and locations of fire-protection cabinets with wall depths.

PART 2 - PRODUCTS

2.1 FIRE-PROTECTION CABINET

- A. Cabinet Type: Suitable for fire extinguisher.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Larsens Manufacturing Company; Architectural Series, or comparable product by one of the following:
 - a. JL Industries, Inc.; Embassy Series.
 - b. Potter Roemer LLC; Dana Series.
- B. Cabinet Material: Cold-rolled steel sheet.
- C. Door Material: Stainless-steel sheet.
- D. Door Style: Vertical duo panel with frame.
- E. Door Hardware: Manufacturer's Institutional Grade door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.

- F. Mounting:
 - 1. Semi-recessed with 2.5" projection; typical UNO
 - 2. Surface mounted where shown on masonry in Gymnasium and other locations as indicated on drawings.
- G. Glazing: Clear Tempered Safety Glass
- H. Accessories:
 - 1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire-protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
 - 2. Door Lock: Cam lock that allows door to be opened during emergency by pulling sharply on door handle.
- I. Materials:
 - 1. Cold-Rolled Steel: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.
 - a. Finish: Baked enamel or powder coat.
 - b. Color: As selected by Architect from manufacturer's full range.
 - 2. Stainless Steel: ASTM A 666, Type 304.
 - a. Finish: No. 4 directional satin finish.

2.2 FABRICATION

- A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Prepare recesses for recessed fire-protection cabinets as required by type and size of cabinet and trim style.
- B. Install fire protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction and as directed by Architect.
- C. Fire-Protection Cabinets: Fasten cabinets to structure, square and plumb.
- D. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

END OF SECTION

SECTION 104416 - FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Portable, hand-carried fire extinguishers and mounting brackets for fire extinguishers.

1.2 ACTION SUBMITTALS

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

1.3 INFORMATIONAL SUBMITTALS

- A. Warranty: Sample of special warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

1.5 COORDINATION

- A. Coordinate type and capacity of fire extinguishers with fire-protection cabinets to ensure fit and function.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.

- 1. Warranty Period: 6 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
- B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

- A. Fire Extinguishers: Type, size, and capacity for each fire-protection cabinet and mounting bracket indicated.

- 1. Basis-of-Design Product: Subject to compliance with requirements, provide Larsens Manufacturing Company; Model MP10, or comparable product by one of the following:

- a. Amerex Corporation.
- b. Ansul Incorporated.
- c. Badger Fire Protection.

- d. Fire End & Croker Corporation.
- e. Guardian Fire Equipment, Inc.
- f. JL Industries, Inc.; a division of the Activar Construction Products Group.
- g. Moon American.
- h. Nystrom Building Products.
- i. Potter Roemer LLC.
- j. Pyro-Chem; Tyco Safety Products.
- k. Strike First Corporation of America.

2. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B.

- B. Multipurpose Dry-Chemical Type: UL-rated 4-A:80-B:C, 10-lb (4.5-kg) nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

2.3 MOUNTING BRACKETS

- A. Mounting Brackets: Manufacturer's standard galvanized steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
- B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.

1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.

- a. Orientation: As directed by Architect.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Examine fire extinguishers for proper charging and tagging.
 - 1. Remove and replace damaged, defective, or undercharged fire extinguishers.
- B. General: Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.
- C. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

END OF SECTION

SECTION 105626 - STORAGE SHELVING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Steel-bracket shelving

1.2 ACTION SUBMITTALS

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

1.3 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For mobile shelving systems and operating manuals to include in maintenance manuals.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Shelf Units: 10 of each size and type indicated.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A manufacturer capable of fabricating mobile storage shelving that meets or exceeds performance requirements indicated and of documenting this performance by test reports, and calculations.
- B. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of support rail anchors, depressed slab, embedded conduit, and other construction contiguous with mobile storage shelving by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain mobile storage systems including shelving from single manufacturer.

2.2 STEEL-BRACKET SHELVING

- A. Provide Industrial Steel Shelving by Uline, or comparable product
- B. Steel-Bracket Shelving: ANSI Z39.73, shelving consisting of two uprights and two spreaders per section forming a four-sided frame, with adjustable shelves on one or both sides of uprights cantilever-hung by brackets. Configure units for mounting on mobile carriages.
- C. Shelving Units
 1. Type: Welded, self-supporting units.
 2. Configuration: Single-faced units
 3. Width: 36 inches
 4. Height: 75 Inches
 5. Shelf Depth: 12 inches
 6. Shelf Styles: Provide the following styles and numbers of adjustable shelves:
 - a. Flat: 6 adjustable shelves per unit
- D. Frames:
 1. Uprights: Steel channels, 0.060 inch (1.52 mm) thick, with slots to receive shelf bracket tabs at 1 inch (25 mm) o.c.
 2. Spreader: Tube steel, 0.060 inch (1.52 mm) thick.
- E. Adjustable Shelves: 0.048-inch- (1.22-mm-) thick cold-rolled steel sheet. Provide two brackets per shelf; 0.060-inch- (1.52-mm-) thick cold-rolled steel.
- F. Base: Manufacturer's standard for attachment to mobile carriages.

2.3 STEEL FINISHES

- A. 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.
- B. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat to achieve a minimum dry film thickness of 2 mils (0.05 mm).

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

- A. Level and plumb tracks to a tolerance of 0.09 inch in 120 inches (2.4 mm in 3.048 m) with no more than 0.06-inch (1.5-mm) variation between adjacent rails. Use permanent shims or non-shrink grout as indicated by manufacturer.

3.3 SHELVING INSTALLATION

- A. Attach shelving units to carriages according to manufacturer's written instructions and as required to prevent vibration during movement.
 - 1. Level and plumb shelving units to a tolerance of 1/8 inch in 96 inches (3 mm in 2438 mm).
- B. Starter/Adder Units: Connect groups together with standard fasteners according to manufacturer's written instructions, using concealed fasteners where possible.
- C. Install shelves in shelving units at locations indicated on Drawings and according to manufacturer's written instructions.

3.4 CLEANING AND PROTECTING

- A. Repair or remove and replace defective work as directed on completion of installation.
- B. Clean finished surfaces, touch up as required, and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.
- C. Protect installed products from damage during remainder of the construction period.

END OF SECTION 105626

SECTION 113013 - RESIDENTIAL APPLIANCES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Cooking appliances.
 - 2. Kitchen exhaust ventilation.
 - 3. Refrigeration appliances.
 - 4. Washing and Dryer appliances

1.2 ACTION SUBMITTALS

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

1.3 INFORMATIONAL SUBMITTALS

- A. Warranties: Manufacturer's standard warranty for each appliance.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For each residential appliance to include in operation and maintenance manuals.

1.5 WARRANTY

- A. Warranties: Provide manufacturer's standard warranty for each appliance.

PART 2 - PRODUCTS

2.1 APPLIANCES

- A. Basis-of-Design Products: Subject to compliance with requirements, provide products below:
- B. Electric Cooktop Range:
 - 1. Basis-of-Design Product: GE; Model JB480DTBB
 - 2. Width: 30 inches
 - 3. Electric Burner Elements: Four; radiant type.
 - 4. Top Material: Ceramic glass.
 - 5. Color/Finish: Black.
- C. Microwave Oven:
 - 1. Basis-of-Design Product: GE; Model PES7227SLSS
 - 2. Mounting: Countertop
 - 3. Capacity: 2.2 cu. ft.

4. Color/Finish: Stainless Steel.
- D. Ducted Range Hood:
1. Basis-of-Design Product: Broan: BWP2304SS
 2. Mounting: Wall Mounted Canopy
 3. Size: 30 in
 4. Max Blower Airflow: 450 CFM
 5. Color/ Finish: Stainless Steel
- E. Front Load Clothes Washer:
1. Basis-of-Design Product: Whirlpool WFW560CH
 2. Capacity: 4.3 cu. ft.
- F. Front Load Clothes Dryer
1. Basis-of-Design Product: Whirlpool WHD560CH
 2. Capacity: 7.4 cu. ft.
 3. Type: Ventless Heat pump
- G. Refrigerator/Freezer: Two-door refrigerator/freezer with freezer on top and complying with AHAM HRF-1.
1. Basis-of-Design Product: GE; Model GTE19JSN
 2. Type: Freestanding.
 3. Storage Capacity: 19.2 cu. ft.
 4. Color/Finish: Stainless Steel.
- H. Dishwasher: Complying with AHAM DW-1 and ASSE 1006.
1. Basis-of-Design Product: GE; Model GDF570SSFSS.
 2. Type: Built-in undercounter with water filtration system.
 3. Controls: Front-mounted electronic tactile buttons.
 4. Capacity: 16 place settings.
 5. Tub and Door Liner: Stainless steel.
 6. Appliance Color/Finish: Stainless steel.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Built-in Equipment: Securely anchor units to supporting cabinets or countertops with concealed fasteners. Verify that clearances are adequate for proper functioning and that rough openings are completely concealed.
- B. Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.
- C. Utilities: Comply with plumbing and electrical requirements.

3.2 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:

1. Perform visual, mechanical, and electrical inspection and testing for each appliance according to manufacturers' written recommendations. Certify compliance with each manufacturer's appliance-performance parameters.
 2. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.
 3. Operational Test: After installation, start units to confirm proper operation.
 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and components.
- C. An appliance will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

END OF SECTION

SECTION 116623 - GYMNASIUM EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Basketball equipment.
2. Volleyball equipment.
3. Badminton equipment.
4. Electronic Scoreboard.
5. Safety pads.
6. Gymnasium Floor Cover System and Storage Rack.
7. Wall Mounted Bench

B. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for oversized recessed voids to be cast in concrete slabs and footings.
2. Section 096466 "Wood Athletic Flooring" for game lines and markers.
3. Section 116653 "Gymnasium Dividers" for gymnasium divider curtain systems.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include assembly, disassembly, and storage instructions for removable equipment.
2. Motors: Show nameplate data, ratings, characteristics, and mounting arrangements.

B. Shop Drawings: For gymnasium equipment.

1. Include plans, elevations, sections, and attachment details.
2. Include details of field assembly for removable equipment, connections, installation, mountings, floor inserts, and operational clearances.
3. Include transport and storage accessories for removable equipment.
4. Include diagrams for power, signal, and control wiring.

C. Samples: For each exposed product and for each item and color specified.

D. Samples for Initial Selection: For each type of gymnasium equipment.

E. Samples for Verification: For the following products:

1. Pad Fabric: Wall padding minimum 3 inches square, and corner and column Samples minimum 3 inches long, with specified treatments applied. Mark face of material.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Court layout plans, reflected ceiling plans, and other details, drawn to scale, and coordinated with ceiling-suspended gymnasium equipment, floor inserts, game lines, and markers applied to finished flooring, and coordinated with each other, using input from installers of the items involved:

1. Structural members to which overhead-supported gymnasium equipment will be attached.
 2. Suspended ceiling components, if any.
 3. Items supported from building structure above the courts, including the following:
 - a. Luminaires.
 - b. Air outlets and inlets.
 - c. Sprinklers.
 - d. Smoke detectors.
- B. Setting Drawings: For embedded items and cutouts required in other work.
- C. Qualification Data: For Installer.
- D. Product Certificates: For each type of gymnasium equipment.
- E. Sample Warranty: For special warranty.
- 1.4 CLOSEOUT SUBMITTALS
- A. Operation and Maintenance Data: For gymnasium equipment to include in operation and maintenance manuals.
- 1.5 QUALITY ASSURANCE
- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- 1.6 FIELD CONDITIONS
- A. Field Measurements: Verify position and elevation of floor inserts and layout for gymnasium equipment.
- 1.7 WARRANTY
- A. Special Warranty: Manufacturer agrees to repair or replace components of gymnasium equipment that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
 - a. Basketball backboard failures, including glass breakage.
 - b. Faulty operation of basketball backstops.
 2. Warranty Period
 - a. Basketball equipment: Twenty years from date of Substantial Completion.
 - b. Floor Coverings: Seventeen years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 BASKETBALL EQUIPMENT

- A. Provide Porter Forward Fold Backstop (Motorized Retractable) 90917000
- B. Source Limitations: Obtain from single source from single manufacturer.
- C. Protruding fasteners or exposed bolt heads on front face of backboards are not permitted.
- D. Connections: Manufacturer's standard connections or connections recommended in writing by manufacturer and complying with Section 055000 "Metal Fabrications" of size and type required to transfer loads to building structure.
- E. Overhead-Supported Backstops:
 - 1. Folding Type: Manufacturer's standard assembly for forward-folding, front-braced backstop, with hardware and fittings to permit folding.
 - 2. Framing: Steel pipe, tubing, and shapes designed to minimize vibration during play.
 - a. Center-Mast Frame: Welded and bolted or clamped with side sway bracing.
 - b. Finish: Manufacturer's standard polyester powder-coat finish
 - 3. Goal Height Adjuster: Adjustable from 8 to 10 feet (2.40 to 3.05 m) to top of ring with gear-drive mechanism, locking in any position within adjustment range, with visible height scale attached to side of framing.
 - a. Operation:
 - 1) Manual operation with detachable crank handle.
- F. Backstop Safety Device: Designed to limit free fall if support cable, chains, pulleys, fittings, winch, or related components fail; with mechanical automatic reset; 6000-lb load capacity; one per folding backstop
- G. Backstop Electric Operator: Provide operating machine of size and capacity recommended in writing by manufacturer for equipment specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, and remote controls. Coordinate wiring requirements and electrical characteristics with building electrical system.
 - 1. Electrical Components, Devices, and Accessories: Listed and labeled according to NFPA 70, by a qualified testing agency, and marked for intended location and application.
 - 2. Operator Type: Cable drum with grooved drum and cable tension device to automatically take up cable slack and retain cable in grooves.
 - 3. Operator Mounting: As indicated on drawings
 - 4. Motor Electrical Characteristics:
 - a. Horsepower: [1/2] [3/4] [1] hp.
 - b. Voltage: 115 V ac, single phase, 60 hertz.
 - 5. Remote-Control Station(s): NEMA ICS 6, Type 1 enclosure for surface mounting and momentary-contact, three-position, switch-operated control with up, down, and off functions.

- a. Group Key Switch Control Stations: One switch per each backstop
 - b. Keys: Provide two keys per station.
 - c. Switches, Ganged: Single faceplate with multiple switch cutouts for three switches operating six backstops
 - d. Control Station Enclosure: Provide prime-painted metal enclosure with [integrally formed padlock hasps] [key access, with two sets of keys per enclosure].
6. Limit Switches: Adjustable switches at each backstop, interlocked with motor controls and set to automatically stop backstop at fully retracted and fully lowered positions.
- H. Basketball Backboards:
- 1. Provide Porter Model #00205-350 Clear Glass Rectangular Backboard
 - 2. Shape and Size:
 - a. Rectangular, 72 by 48 inches width by height
 - 3. Backboard Material: Provide with predrilled holes or preset inserts for mounting goals, and as follows:
 - a. Glass: Minimum 1/2-inch- (13-mm-) thick, transparent tempered glass according to ASTM C1048 Kind FT (fully tempered) and with impact-testing requirements in 16 CFR 1201 Category II or ANSI Z97.1 Class A for safety glazing.
 - 1) Frame: Provide glass with impact-absorbing resilient rubber or PVC gasket around perimeter in a fully welded, painted steel frame, with steel subframe, reinforcement, bracing, and mounting slots for mounting backboard frame to backstop.
 - 2) Standard Mount: Provide steel corner reinforcement with mounting slots for mounting backboard frame to backstop at standard mounting centers. Provide center-strut frame reinforcement.
 - 3) Rim-Restraining Device: According to NCAA and NFHS rules and designed to ensure that basket remains attached if glass backboard breaks.
 - 4. Target Area and Border Markings: Permanently etched in white color, marked in manufacturer's standard pattern and stripe width
- I. Goal-Mounting Assembly: Compatible with goal, backboard, and backstop; with manufacturer's standard hole pattern for goal attachment.
- 1. Direct Mount: Designed for mounting goal directly and independently to center mast of backstop, so that no force is transmitted by ring directly to backboard, and rigidity and stability of goal are maximized.
- J. Basketball Goals: Basket ring complete with flanges, braces, attachment plate, and evenly spaced loops welded around underside of ring.
- 1. Provide Porter Pro-Strut Rim Goal Model No. 00252-500 Torq-Flex Goal
 - 2. Single-Rim Basket Ring Competition Goal: Materials, dimensions, and fabrication per manufacturer's standard design

- a. Movable: Pressure-release design with manufacturer's standard breakaway mechanism and rebound characteristics identical to those of fixed, nonmovable ring.
- 3. Field Adjustment: Provide ring that is field adjustable for rebound elasticity without being removed from the backboard.
- 4. Mount: [Front] [Rear].
- K. Basketball Nets: 12-loop-mesh net, between 15 and 18 inches (380 to 460 mm) long, sized to fit ring diameter, and as follows:
 - 1. Competition Cord: Antiwhip, made from white nylon cord, minimum 120-gm thread and maximum 144-gm thread.
- L. Backboard Safety Pads: Designed for backboard thickness and extending continuously along bottom and up sides of backboard and over backstop according to manufacturer's standard design
 - 1. Attachment: Manufacturer's standard.
 - 2. Color: As selected by Architect from manufacturer's full range

2.2 VOLLEYBALL EQUIPMENT

- A. Provide Porter Athletic Inc., Composite International Volleyball Package
- B. Source Limitations: Obtain from single source from single manufacturer.
- C. Floor Insert: Solid-brass floor plate and steel pipe sleeve, concealed by floor plate, with capped bottom end, sized with ID to fit post standards, minimum length required to securely anchor pipe sleeve below finished floor in concrete footing with anchors designed for securing floor insert to floor substrate indicated; one per post standard
 - 1. Floating Wood Floor, Floor Plate: Lockable swivel access cover, designed for use with floating wood floors and to be flush with adjacent flooring. Provide one tool(s) for unlocking access covers.
- D. Post Standards: Removable, adjustable-height, telescoping, paired volleyball post standards as indicated on Drawings, designed for easy removal from permanently placed floor inserts.
 - 1. Materials: Composite aluminum and carbon fiber pipe or tubing, with non-marking plastic or rubber end cap or floor bumper to protect permanent flooring.
 - 2. Nominal Pipe or Tubing Diameter: 4-inch OD at base.
 - 3. Finish: Manufacturer's standard factory-applied, polyester powder-coat finish
 - 4. Telescopic and Net Height Adjuster System: Provide manufacturer's standard telescoping system with locking device, telescopic post, and fittings for holding net at selected height; designed for height adjustment of post standard to position net at heights indicated.
 - 5. Height Markers: Clearly marked at regulation play heights for men's competition through elementary school settings
- E. Net: 32 feet long; one per pair of paired post standards and as follows:
 - 1. Width and Nylon Mesh: Competition volleyball net, 36 inches with 4-inch- square mesh made of black nylon string.

- a. Hem Band Edges: White, minimum 2-inch- wide top, bottom, and side bindings; minimum 1-inch-wide tension straps at top, bottom, and midpoint of each side end of net; end sleeves for dowels; and lines with linkage fittings threaded through top and bottom hems of binding. Provide lengths of lines and linkage fittings as required to properly connect to and set up net for post-standard spacing indicated on Drawings.
 - 2. Dowels: Minimum 1/2-inch- diameter fiberglass. Provide two dowels per net threaded through each side hem sleeve for straightening net side edges.
 - 3. Net Antennas: 3/8-inch- diameter, high-tensile-strength, extruded-fiberglass, or plastic rods, 72 inches long, extending above top hem band of net, with alternating white and red bands according to referenced standard rules. Provide two antennas per net.
 - a. Clamps: Designed to secure antenna to top and bottom of net.
- F. Net-Tensioning System: Designed to adjust and hold tension of net. Fully enclosed, nonslip, manufacturer's standard-type winch with cable length and fittings for connecting to net lines, positive-release mechanism, and manufacturer's standard handle. Mount net tensioner on post standard at side away from court. Provide end post with post top pulley. Provide opposing post with welded-steel loops, hooks, pins, or other devices for net attachment and post top grooved line guide.
- G. Safety Pads: Consisting of minimum 1-inch- thick, multiple-impact-resistant manufacturer's standard foam filler covered by puncture- and tear-resistant fabric cover, with fire-test-response characteristics indicated, and lined with fire-retardant liner. Provide pads with hook-and-loop closure or attachments for the following components:
 - 1. Post Standards: Wraparound style pads, designed to totally enclose each standard to a minimum height of 72 inches; one per post.
 - 2. Net Lines: Four per net.
 - 3. Fabric Cover Flame-Resistance Ratings: Complies with NFPA 701
 - 4. Fabric Color: As selected by Architect from full range of industry standard colors and color densities
- H. Post Standard Transporter: Manufacturer's standard wheeled unit designed for transporting a single post.
- I. Storage Cart: Manufacturer's standard wheeled unit designed for transporting and storing volleyball equipment and passing through 36-inch- wide door openings. Fabricate welded-steel tubing units with heavy-duty casters, including no fewer than two swivel casters. Fabricate wheels from materials that do not damage or mark floors; number of units as required to provide transport and storage for specified equipment.

2.3 BADMINTON EQUIPMENT

- A. Provide Porter Athletic Inc., Model No. 764100 badminton standards
- B. Source Limitations: Obtain from single source from single manufacturer.
- C. Floor-Insert Adaptor: Pipe sleeve adaptor to convert volleyball floor-insert sleeve to fit badminton post standard; one per badminton post standard
- D. Post Standards: Paired badminton post standards, designed for easy removal from permanently placed floor inserts.

1. Material: Steel pipe or tubing, with plastic or rubber end cap or non-marking floor bumper to protect permanent flooring.
 2. Nominal Pipe or Tubing Diameter: 2-3/8-inch OD at base.
 3. Finish: Manufacturer's standard factory-applied, polyester powder-coat finish.
 4. Net Height Setting: By preset net hooks
- E. Net: Competition badminton net, 20 feet long and as follows; one per pair of paired post standards
1. Width and Mesh: 30 inches with 3/4-inch- square mesh made of purple, dark brown, or black nylon string.
 - a. Hem Band Edges: White, 3-inch- wide top binding; purple, dark brown, or black 3/4-inch-wide bottom and side bindings; tie offs at top, bottom, and midpoints eliminating gap at each side end of net; and minimum 1/8-inch- diameter rope, at least 42 feet long, threaded through top hem of binding. Provide lengths of lines and linkage fittings as required to properly connect to and set up net for post-standard spacing indicated on Drawings.
- F. Storage Cart: Manufacturer's standard wheeled unit designed for transporting and storing badminton equipment and passing through 36-inch- wide door openings. Fabricate welded-steel tubing units with heavy-duty casters, including no fewer than two swivel casters. Fabricate wheels from materials that do not damage or mark floors; number of units as required to provide transport and storage for specified equipment.
- G. Safety Pads: Consisting of minimum 1-inch- thick, multiple-impact-resistant manufacturer's standard foam filler covered by puncture- and tear-resistant fabric cover, with fire-test-response characteristics indicated, and lined with fire-retardant liner. Provide pads with hook-and-loop closure or attachments for the following components:
1. Post Standards: Wraparound style pads, designed to totally enclose each standard to a minimum height of 72 inches ; one per post.
 2. Net Lines: Four per net.
 3. Fabric Cover Flame-Resistance Ratings: Complies with NFPA 701
 4. Fabric Color: As selected by Architect from full range of industry standard colors and color densities.

2.4 SAFETY PADS

- A. Provide Porter Athletic Inc., No 575 FireSafe Wall Pads
- B. Source Limitations: Obtain from single source from single manufacturer.
- C. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 1. Flame-Spread Index: 25 or less.
 2. Smoke-Developed Index: 50 or less.
- D. Pad Coverings: Provide safety pad fabric covering that is fabricated from puncture- and tear-resistant, PVC-coated polyester or nylon-reinforced PVC fabric, minimum 14-oz./sq. yd. and treated with fungicide for mildew resistance; with surface-burning characteristics indicated, and lined with fire-retardant liner

- E. Wall Safety Pads: Padded wall wainscot panels designed to be attached in a continuous row; each panel section consisting of fill laminated to backer board, with visible surfaces fully covered by seamless fabric covering, free of sag and wrinkles and firmly attached to back of backer board.
 - 1. Backer Board: Minimum 7/16" thick oriented strand board (OSB).
 - 2. Fire-Resistive Fill: Multiple-impact-resistant foam minimum 2-inch- thick, fire-resistive neoprene, 6.0-lb/cu. ft. density.
 - 3. Size: Each panel section 24 inches wide by minimum 84 inches long
 - 4. Number of Modular Panel Sections: As indicated on Drawings
 - 5. Installation Method: Concealed mounting Z-clips
 - 6. Fabric Covering Color(s): One color: Yellow Gold

- F. Provide two sections of wall padding, 14 feet wide by 84 inches long for custom graphics area.
 - 1. Custom graphic tbd.

- G. Corner Wall Safety Pads: Wall corner pad consisting of minimum 1-1/4-inch- thick, multiple-impact-resistant, closed-cell, polyethylene-foam filler, covered on both sides and all edges by fabric covering with backer board and manufacturer's standard anchorage to wall

- H. Cutout Trim: Manufacturer's standard flanged cutout trim kits for fitting pads around switches, receptacles, and other obstructions.
 - 1. Color: Black.

2.5 ELECTRONIC SCOREBOARD

- A. Interior, electronic basketball scoreboard with two integral horns and LED displays for time, scores, period, number for player fouling with personal fouls, team fouls, time outs left, bonus and double bonus indicators and next possession arrows; Team Name and Intelligent Captions™ 100% electronic. Model 2781 as manufactured by Nevco.
 - 1. Size: 10 feet long x 5 feet high x 8 inches deep
 - 2. Approximate hanging weight: 135 pounds
 - 3. Intelligent Captions™ and Electronic Team Names: 8 x 48 pixel "Home", "Guests", 8 x 16 pixel "fls", "tol", and 8 x 32 pixel "player". All Captions and Team Names are 2 LED per Pixel, 16mm pixel to pixel centers. Pixel matrices shall be available in Red or Amber. Period caption plate; 5" white lettering on black background. Intelligent Captions™ shall be altered on a per-sport basis for Volleyball, Wrestling and Basketball automatically.
 - 4. Additional Intelligent Caption™ names per sport shall read: won, set, pts, time, weight, where appropriate.
 - 5. LED displays:
 - a. Timing: Super Bright Red or White 13 inches high digits with lit colon.
 - b. Team scores: Super Bright Amber or White 13 inches high digits.
 - c. Period: Super Bright Amber or White 9 inches high digits.
 - d. Player number and fouls: Super Bright Red or White 9 inches high digits.
 - e. Team fouls & time outs left (tol): Super Bright Amber or White 9 inches high digits.
 - f. Next possession: Super Bright Amber or White arrow for each team.
 - g. Bonus and double bonus in the form of a 4-inch Super Bright Red or White LED "B".
 - h. Suspension mounting attachments will be included.
 - i. Power requirement: 175 Watts, MAX, 100-240 Volts AC w/Power Factor Correction

6. Provide each scoreboard or accessory with control cable of length required. Coordinate Electrical junction boxes, conduits, mounting hardware, and other accessories as required for complete installation.
- B. CONTROL CENTER – Provide both Wired and Wireless type controllers:
1. Type: Wired, microprocessor-based operator's control center designed to operate different models of scoreboard by interchange of keyboard overlay; Model MPC as manufactured by Nevco
 - a. Console: High impact, break-resistant gray plastic [11 x 9-1/2 x 4-1/8 inches] [279 x 241 x 105 mm].
 - b. Features:
 - 1) Provide with LED displays, lithium cell battery backup to maintain scoreboard memory and time of day, self test mode, power on-off switch, alternate time control, and multiple scoreboard operation.
 - 2) Split and raised 40 key keyboard, internal beeper acknowledging each entry, and bookmark capabilities.
 - 3) Keyboard overlays for scoreboard or accessory.
 - 4) Remote hand-held main time switch with integral horn button.
 - 5) [25 feet] [7.6 m] control cable with connectors.
 - 6) Timer features: Time of day display, multiple time out timers with warning, interval horn, up-count auto stop with horn, and 1/10th second display during last minute.
 - 7) Dimmer control for scoreboard.
 - 8) Power requirements: 120 volts, 12 watts, 50/60 Hz.
 2. Type: Wireless, microprocessor based, operator's control center with receiver unit mounted at scoreboard and designed to operate different models of scoreboard by interchange of keyboard overlay; Model MPCW as manufactured by Nevco
 - a. Unit shall comply with Part 15 of FCC Rules regarding interference.
 - b. Console: High impact, break-resistant gray plastic [11 x 9-1/2 x 4-1/8 inches] [279 x 241 x 105 mm].
 - c. Features:
 - 1) Control can be used to operate both wireless and wired scoreboards.
 - 2) Power on-off switch.
 - 3) Split and raised 40 key keyboards, internal beeper acknowledging each entry, and bookmark capabilities.
 - 4) Keyboard overlays for scoreboard or accessory.
 - 5) Remote hand-held main time switch with integral horn button.
 - 6) Provide with LED displays, lithium cell battery backup to maintain scoreboard memory and time of day, self test mode, power on-off switch, alternate time control, and multiple scoreboard operation.
 - 7) Timer features: Time of day display, multiple time out timers with warning, interval horn, upcount auto stop with horn, and 1/10th second display during last minute.
 - 8) Dimmer control for scoreboard.
 - 9) Receiver: Sturdy impact resistant construction, [6 x 4 x 1.5 inches] [152 x 102 x 38 mm] with [4 inch] [102 mm] antenna and mounted at scoreboard
 - 10) Maximum range: [1,000 feet] [305 m] from control center to receiver.
 - d. Receiver shall require no additional source of power or separate control cabl
 - e. Power adapters: Provide for each control center.
 - f. Input: 120 volts, 0.4 amps, 50/60 Hz.
 - g. Provide option of battery supply for control operation if utility power not available.
 - h. Provide carrying case for control center and hand-held switch; Model CC-3 as manufactured by Nevco.
 - 1) Size: [18-1/2 x 14-1/2 x 6 inches] [470 x 368 x 152 mm].

- 2) Construction: Double wall, high density black polyethylene with padded interior, mechanical latches, and hinges.

2.6 GYM FLOOR COVER SYSTEM AND STORAGE RACK

- A. Provide cover system and storage rack by All Court Covers
- B. Source Limitations: Obtain from single source from single manufacturer.
- C. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 1. Flame-Spread Index: 25 or less.
 2. Smoke-Developed Index: 50 or less.
- D. Floor Coverings: Manufacturer's standard 3-ply strengthened polyester mesh coated with PVC on each side in 10-foot-wide sections.
 1. Material Weight: 32 oz.
 2. Color: As selected from manufacturer's full standard range
- E. Storage Rack: Multi-roller portable storage rack with heavy duty non-marking polyurethane locking casters
 1. Capacity: 3000 lbs. minimum, supporting up to 10 rolls.
 2. Nominal rack dimensions: 12 feet wide by 35 inches deep to fit through standard institutional door
 3. Standard steel hand crank.
 - a. Provide (1) extra hand crank for attic stock.

2.7 WALL MOUNTED BENCH

- A. Provide fixed bench by ASI Storage Solutions:
 1. 1-1/4 inches thick hardwood top
 2. Size:
 - a. 9.5 inches wide x 120 inches long
 3. Wall Brackets: 0.250 inches powder coated cold rolled steel with diagonal brace and rounded edges

2.8 MATERIALS

- A. Support Cable: Manufacturer's standard galvanized-stranded-steel wire rope with a breaking strength of 7000 lb. Provide fittings according to the wire rope manufacturer's written instructions for size, number, and installation method.
- B. Support Chain and Fittings: For chains used for overhead lifting, provide Grade 80 heat-treated alloy-steel chains, according to ASTM A391/A391M, with commercial-quality, zinc-plated steel connectors and hangars.
- C. General-Purpose Chain: For chains not used for overhead lifting, provide carbon steel chain, according to ASTM A413/A413M (Grade 30 proof coil chain or higher grade recommended by gymnasium)

equipment manufacturer). Provide coating type, chain size, number, and installation method according to manufacturer's written instructions.

- D. Castings and Hangers: Malleable iron, according to ASTM A47/A47M; grade as required for structural loading.
- E. Softwood Plywood: DOC PS 1, exterior.
- F. Particleboard: ANSI A208.1.
- G. Anchors, Fasteners, Fittings, and Hardware: Gymnasium equipment manufacturer's standard corrosion-resistant or noncorrodible units; concealed; tamperproof, vandal- and theft-resistant design].
- H. Grout: Nonshrink, nonmetallic, premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout, according to ASTM C1107/C1107M, with minimum strength recommended in writing by gymnasium-equipment manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for court layout, alignment of mounting substrates, installation tolerances, operational clearances, accurate locations of connections to building electrical system, and other conditions affecting performance of the Work.
 - 1. Verify critical dimensions.
 - 2. Examine supporting structure, subgrades, subfloors, and footings below finished floor.
 - 3. Examine wall assemblies, where reinforced to receive anchors and fasteners, to verify that locations of concealed reinforcements are clearly marked. Locate reinforcements and mark locations.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Comply with manufacturer's written installation instructions for each type of gymnasium equipment.
- B. Install gymnasium equipment after other finishing operations, including painting, have been completed unless otherwise indicated.
- C. Permanently Placed Gymnasium Equipment and Components: Install rigid, level, plumb, square, and true; anchored securely to supporting structure; positioned at locations and elevations indicated; in proper relationship to adjacent construction; and aligned with court layout.
 - 1. Floor-Insert Locations: Coordinate locations with application of game lines and markers
 - 2. Floor-Insert Elevation: Coordinate installed heights of floor inserts with installation and field finishing of finish flooring and floor-plate type.
 - 3. Operating Gymnasium Equipment: Verify clearances for movable components of gymnasium equipment throughout entire range of operation and for access to operating components.
- D. Floor-Insert Setting: Clean oversized, recessed voids in concrete substrate of debris. Position each sleeve, and fill void around sleeve with grout, mixed and placed according to grout manufacturer's written instructions. Protect portion of sleeve above subfloor from splatter. Verify that sleeves are set

plumb, aligned, and at correct height and spacing; hold in position during placement and finishing operations until grout is sufficiently cured. Set insert so top surface of completed unit is flush with finished flooring surface.

- E. Anchoring to In-Place Construction: Use anchors and fasteners where necessary to secure built-in and permanently placed gymnasium equipment to structural support and to properly transfer load to in-place construction.
- F. Connections: Connect electric operators to building electrical system.
- G. Removable Gymnasium-Equipment Components: Assemble in place to verify that equipment and components are complete and in proper working order. Disassemble removable gymnasium equipment after assembled configuration is approved by [Architect] [Owner], and store units in location indicated on Drawings.

3.3 INSTALLATION OF SAFETY PADS

- A. Mount with bottom edge at dimension indicated on Drawings above finished floor.
- B. Cutout Trim: Limit cuts in face of padding so that cuts are securely and fully concealed behind trim-kit flange.

3.4 ADJUSTING

- A. Adjust movable components of gymnasium equipment to operate safely, smoothly, easily, and quietly; free from binding, warp, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range; and lubricate as recommended in writing by manufacturer.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain gymnasium equipment.

END OF SECTION

SECTION 116653 - GYMNASIUM DIVIDERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Peak-fold divider systems.
 - 2. Electric operators.
 - 3. Divider curtains.
 - 4. Divider system accessories.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Motors: Show nameplate data, ratings, characteristics, and mounting arrangements.
- B. Shop Drawings: For gymnasium dividers.
 - 1. Include plans showing alignment of curtains in relation to sport-court layout and overhead structural supports.
 - 2. Include elevations, sections, details, and attachments to other work.
 - 3. Include system clearances, stacking requirements, and limits for fitting into adjacent construction.
 - 4. Include point loads and locations for attachment of gymnasium dividers to structure.
 - 5. Include diagrams for power, signal, and control wiring.
- C. Samples: For each exposed product and for each item and color specified.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: For each type of gymnasium divider.
- C. Sample Warranty: For special warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For gymnasium dividers to include in operation and maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.6 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of gymnasium dividers that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Faulty operation of gymnasium dividers.
 - b. Tearing or deterioration of fabric, seams, or other materials beyond normal use.
 - 2. Warranty Period: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PEAK-FOLD DIVIDER SYSTEMS

- A. Provide Porter Athletic Equipment Inc., Slope Fold Divider Curtain Model No. 90665-00
- B. Source Limitations: Obtain from single source from single manufacturer.
- C. Divider-Curtain System: Electrically operated, upward folding, cable suspended, and as follows:
 - 1. Top Hem: Double-thickness mesh or solid vinyl for pipe battens.
 - 2. Outer Edge Hems: Triple turned and welded.
 - 3. Bottom Curtain Pocket: 6 inches with manufacturer's standard pipe batten with padding.
 - 4. Grommets: Manufacturer's standard material, size, and spacing; for lift cables to pass through curtain fabric.
 - 5. Support Cable: Manufacturer's standard vandal-proof galvanized-stranded-steel aircraft cable. Provide fittings according to cable manufacturer's written instructions for size, type, number, and installation method.
 - 6. Support Chain and Fittings: Hardened alloy-steel chain rated for lifting loads indicated, with commercial-quality, corrosion-resistant steel connectors and hangers.
 - 7. Curtain Battens: Fabricate from steel pipe or tubing with a minimum number of joints, as necessary for required lengths. Provide galvanized battens, or shop prime and shop finish with black paint.
 - a. Top and Bottom Battens: 1-1/2-inch- nominal diameter steel pipe.
 - 8. Each hoist cable shall terminate in individual hoist drums on remote electric operator. Each hoist drum shall be sized with a variable diameter ratio system to allow divider curtain to raise and store against peaked structure to conform to existing building conditions to all maximum clearance for all sports

2.2 ELECTRIC OPERATORS

- A. Provide factory-assembled electric operation system of size and capacity recommended in writing and provided by gymnasium divider manufacturer for gymnasium dividers specified, with electric motors and factory-prewired motor controls, control devices, and accessories required for proper operation.
 - 1. Include wiring from control stations to motors and between synchronizer and dual motors for long curtains. Coordinate operator wiring requirements and electrical characteristics with building electrical system.

- B. Electrical Components, Devices, and Accessories: Listed and labeled according to NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Motor Electrical Characteristics:
 - 1. Horsepower: 1 hp.
 - 2. Voltage: 115 V ac single phase, 60 hertz.
- D. Limit Switches: Adjustable switches at each divider curtain, interlocked with motor controls and set to automatically stop divider curtain at fully extended and fully retracted positions.
- E. Control System:
 - 1. Key-Switch Operation: NEMA ICS 6, Type 1 enclosure, momentary-contact, three-position switch-operated control with up, down, and off functions.
 - a. Keys: Provide one key(s) per station.
 - b. Provide lockable, vandal resistant enclosure

2.3 DIVIDER CURTAINS

- A. Upper Curtain, Mesh: Woven mesh of polyester yarn coated with vinyl, weighing not less than 7 oz./sq. yd
 - 1. Mesh Color: As selected by Architect from full manufacturer's range
- B. Lower Curtain, Solid: Woven polyester fabric coated with vinyl, 19 oz./sq. yd, 8-foot height above floor.
 - 1. Fabric Color(s): One color(s), 06-Yellow
- C. Hems: Folded and electronically welded.
- D. Seams: Electronically welded.
- E. Overall Curtain Height: As indicated on Drawings.
- F. Bottom of Curtain: Approximately 2 inches above finished floor.
- G. Divider-Curtain Flame-Resistance Rating: Passes NFPA 701 Test 2

2.4 DIVIDER SYSTEM ACCESSORIES

- A. Safety Lock: Locks drive system when speed exceeds manufacturer's recommended speed
- B. Audible Motion Alarm: Provide alarm with intermittent warning tone when curtain is raised or lowered.

2.5 SUPPORT MATERIALS AND FASTENERS

- A. Support Chain and Fittings: For chains used for overhead lifting, provide Grade 80, heat-treated alloy-steel chains, according to ASTM A391/A391M, with commercial-quality, hot-dip galvanized steel connectors and hangers.

- B. General-Purpose Chain: For chains not used for overhead lifting, provide carbon steel chain, according to ASTM A413/A413M, Grade 30 proof coil chain or higher grade recommended by gymnasium divider manufacturer. Provide coating type, chain size, number, and installation method according to manufacturer's written instructions.
- C. Anchors, Fasteners, Fittings, and Hardware: Manufacturer's standard corrosion-resistant or noncorrodible units; concealed; vandal-resistant design.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for alignment of mounting substrates, installation tolerances, operational clearances, locations of connections to building electrical system, and other conditions affecting performance of the Work.
 - 1. Verify critical dimensions.
 - 2. Examine supporting structure.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Comply with manufacturer's written installation instructions.
- B. Install gymnasium dividers after other finishing operations, including painting, have been completed unless otherwise indicated.
- C. Install gymnasium dividers level, plumb, square, and true; anchored securely to supporting structure; positioned at locations and elevations indicated; in proper relation to adjacent construction; and aligned with sport-court layout.
 - 1. Verify clearances for movable components of gymnasium dividers throughout entire range of operation and for access to operating components.
- D. Electric Operators Installation: Connect electric operators to building electrical system.

3.3 ADJUSTING

- A. Adjust movable components of gymnasium dividers to operate safely, smoothly, easily, and quietly, free from binding, warp, distortion, uneven tension, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range; and lubricate as recommended in writing by manufacturer.
- B. Limit Switch Adjustment: Set and adjust upper and lower limit controls.

3.4 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain gymnasium dividers.

END OF SECTION

SECTION 116800 - PLAY EQUIPMENT

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 freestanding and composite structure playground equipment.
- B. Related Sections:
 - 1. Section 321816.13 "Playground Protective Surfacing" for protective surfacing under and around playground equipment.

1.3 DEFINITIONS

- A. Fall Height: According to ASTM F 1487, "the vertical distance between a designated play surface and the protective surfacing beneath it."
- B. Critical Height: Standard measure of shock attenuation. According to CPSC No. 325, this means "the fall height below which a life-threatening head injury would not be expected to occur."
- C. HDPE: High-density polyethylene.
- D. IPEMA: International Play Equipment Manufacturers Association.
- E. LLDPE: Linear low-density polyethylene.
- F. MDPE: Medium-density polyethylene.
- G. Use Zone: According to ASTM F 1487, the "area beneath and immediately adjacent to a play structure or equipment that is designated for unrestricted circulation around the equipment and on whose surface it is predicted that a user would land when falling from or exiting the equipment."

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Initial Selection: For each type of playground equipment and structure indicated.
 - 1. Manufacturer's color charts.

2. Include similar Samples of playground equipment and accessories involving color selection.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 1. Extent of surface systems and use zones for equipment.
 2. Critical heights for playground surfaces and fall heights for equipment.
- B. Qualification Data: For qualified Installer manufacturer, and testing agency.
- C. Product Certificates: For each type of playground equipment, from manufacturer.
- D. Warranty: Sample of special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For playground equipment and finishes to include in maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm whose playground equipment components have been certified by IPEMA's third-party product certification service.
- B. Installer Qualifications: An employer of workers approved by manufacturer.
- C. Safety Standards: Provide playground equipment complying with or exceeding requirements in ASTM F 1487 and CPSC No. 325.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of playground equipment that fail in materials or workmanship within specified warranty period.
 1. Failures include, but are not limited to, the following:
 - a. Structural failures.
 - b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PLAY EQUIPMENT

- A. Play Equipment: Subject to compliance with requirements, provide products by Kompan, Inc. 605 W Howard, Ln, Suite 101, Austin, TX 78753, 1-(800) 426-9788, www.kompan.us, or approved equal. Local contact: Matt Burns, matbur@kompan.com.
1. 2-5 Age Equipment:
 - a. KSW924-Custom 20178842: Portal Swings w/ (1) ADA and (3) Bucket Swings, Color Lime Green posts, yellow connector, brown cross beam, Yellow ADA swing. Anti-wrap hardware.
 - b. PCM725581: Custom Jungle Giant Climber 2-5 with stainless steel slides
 - c. MSC541600-3417P: Forest Giraffe
 - d. ELE400024: Spinner Bowl, Color Medium Green
 2. 5-12 Play Equipment:
 - a. KSW924-Custom 20214510: Portal Swings w/ (1) ADA, and (3) Belt Swings, Color Lime Green posts, yellow connector, brown cross beam, Yellow ADA swing. Anti-wrap hardware.
 - b. PCM725241: Custom Jungle Giant Climber 5-12 with stainless steel slides.
 - c. ELE400065-3717GR: TIPI Carousel with top brace, Color Sand
 - d. CRP250101-0901: Galago Trail, Color Orange – To Be Confirmed during submittal process.

2.2 FITNESS EQUIPMENT (ALTERNATE 3)

- A. Fitness Equipment: Subject to compliance with requirements, provide products by Kompan, Inc. 605 W Howard, Ln, Suite 101, Austin, TX 78753, 1-(800) 426-9788, www.kompan.us, or approved equal. Local contact: Matt Burns, matbur@kompan.com.
1. Fitness Equipment
 - a. FAZ30100: Step, 8 inch, Color Orange
 - b. FAZ30201: Step, 16 inch, Color Orange
 - c. FAZ30300: Step, 24 inch, Color Orange
 - d. FSW238: Leg Lift and Pull Up, Color Anthracite Gray
 - e. FAZ10101- Suspension Trainer, Color Orange

2.3 CAST-IN-PLACE CONCRETE

- A. Concrete Materials and Properties: Comply with requirements in Section 033000 "Cast-in-Place Concrete" to produce normal-weight, air-entrained concrete with a minimum 28-day compressive strength of 3500 psi (20.7 MPa), 3-inch (75-mm) slump, and 1-inch- (25-mm-) maximum-size aggregate.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, site surface and subgrade drainage, and other conditions affecting performance of the Work.

1. Do not begin installation before final grading required for placing protective surfacing is completed unless otherwise permitted by Architect.

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

3.2 PREPARATION

A. Verify locations of playground perimeter and pathways. Verify that playground layout and equipment locations comply with requirements for each type and component of equipment.

3.3 INSTALLATION, GENERAL

A. General: Comply with manufacturer's written installation instructions unless more stringent requirements are indicated. Anchor playground equipment securely, positioned at locations and elevations indicated.

1. Maximum Equipment Height: Coordinate installed heights of equipment and components with finished elevations of protective surfacing. Set equipment so fall heights and elevation requirements for age group use and accessibility are within required limits. Verify that playground equipment elevations comply with requirements for each type and component of equipment.

B. Post and Footing Excavation: Excavate holes for posts and footings as indicated in firm, undisturbed or compacted subgrade soil.

C. Post Set on Subgrade: Level bearing surfaces with drainage fill to required elevation.

D. Post Set with Concrete Footing: Comply with ACI 301, ACI 301M for measuring, batching, mixing, transporting, forming, and placing concrete.

1. Set equipment posts in concrete footing. Protect portion of posts above footing from concrete splatter. Verify that posts are set plumb or at the correct angle, alignment, height, and spacing.

- a. Place concrete around posts and vibrate or tamp for consolidation. Hold posts in position during placement and finishing operations until concrete is sufficiently cured.

2. Embedded Items: Use setting drawings and manufacturer's written instructions to ensure correct installation of anchorages for equipment.

3. Concrete Footings: Smooth top, and shape to shed water.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

- C. Tests and Inspections: For playground and playground equipment and components during installation and at final completion and to certify compliance with ASTM F 1487, CPSC No. 325.
- D. Prepare test and inspection reports.

END OF SECTION

SECTION 116800.01 - SPRAYGROUND SYSTEMS

GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Extent of work is shown on the Drawings and includes but is not limited to:
 - 1. Verify existing and new utility locations.
 - 2. Furnish complete sprayground system where indicated in Drawings
 - 3. Furnish and install sprayground system.
 - 4. Layout and stake, trench, install piping, valves, controller, and wiring as well as other necessary appurtenances to provide complete, operational sprayground system.
 - 5. Check, start-up, adjust and demonstrate operation and winterization of system.
 - 6. Provide an Operations and Maintenance Manual.
 - 7. Provide maintenance and adjustments for one (1) season of operation.
 - 8. Warranty and Guarantee.
- B. Related Sections include the following:
 - 1. Division 2 Section "Earthwork".
 - 2. Division 2 Section "Soil Preparation".
 - 3. Division 3 Section "Cast-In-Place Concrete".
 - 4. Division 22 "Plumbing" and Section 221119 Domestic Water Piping Schedules for backflow preventor.
 - 5. Division 26 "Electrical".
 - 6. DEFINITIONS
- C. Circuit Piping: Downstream from control valves to water features. Piping is under pressure during flow.
- D. Drain Piping: Downstream from circuit piping drain valves. Piping is not under pressure.
- E. Main Piping: Downstream from point of connection to water distribution piping to, and including, control valves. Piping is under water-distribution-system pressure.
- F. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control, signaling power-limited circuits.

1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data and catalogue cuts or equipment data for all of the required components. Include pressure ratings, rated capacities, and settings of selected models for the following:
 - 1. Sprayground equipment including controller and associated valves, pipes, wires, meters, etc.
- B. Shop Drawings: Provide layout drawings of proposed system for review by Landscape Architect and Owner. Show system piping, including plan layout, and locations, types, sizes, capacities,

and flow characteristics of piping components. Show wiring diagram. Show areas of spray and overspray.

- C. Record drawings: At project closeout, submit record drawings of installed sprayground system piping and products, in accordance with Division 1 requirements.
- D. Operation and Maintenance Manual: Including, but not limited to:
 - 1. All equipment data, parts specification and manual sheets.
 - 2. Start-up procedures.
 - 3. Routine maintenance requirements and typical system adjustment needs.
 - 4. Winterization procedures.
 - 5. Controller program.
 - 6. Terms and conditions of guarantee on labor and of warranty on products.
 - 7. Record Drawings: As-built record drawings of installed sprayground system piping and electrical conduit. Provide one (1) hardcopy and one (1) digital record in PDF format.
- E. Qualification Data: For qualified Installer.

1.4 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacturing sprayground systems materials and products, of types and sizes required, whose products have been in satisfactory use in similar service for not less than five (5) years.
- B. Installer's Qualifications: Contractor shall have had experience with at least five (5) other projects of similar scope and complexity and shall perform work with personnel totally familiar with sprayground systems and construction techniques under the supervision of an experienced foreperson.
- C. Applicable requirements of current editions of accepted Standards, Codes and trade practices apply to work of this Section, including, but not limited to:
 - 1. American Society of Testing and Materials (ASTM)
 - 2. National Plumbing Code
 - 3. National Electrical Code (NEC)
 - 4. DELIVERY, STORAGE, AND HANDLING
- D. Deliver, store, handle and protect all materials from damage.
- E. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.
- F. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

1.5 PROJECT CONDITIONS

- A. Coordinate installation of sprayground system with storm drainage systems, underground raceways for electrical systems, concrete paving, and stone masonry.
- B. Protect existing and new construction conditions adjacent to and within the limit of work.
 - 1. All necessary precautions for safety including barricades and other protection measures shall be taken during all work.

2. All heavy equipment shall be driven or parked on the site only where approved by Landscape Architect.
 3. Elements damaged or disturbed during construction including but not limited to existing pavements, structures, walls, and utility lines (above and below grade) shall be repaired or replaced to the satisfaction of the Owner at the cost of the Contractor.
 4. Repair and replace all active utility lines, above and below grade, damaged in the course of construction operations.
- C. Drawings shall be verified in field. Any discrepancies must be brought to the attention of the Landscape Architect prior to proceeding with work.

1.6 SEQUENCING AND SCHEDULING

- A. Coordinate work in this Section with work of all other Sections of the Project Manual.

1.7 GUARANTEE

- A. Guarantee work for two (2) years from date of acceptance against all defects in material, equipment and workmanship. Repairs, if required, shall be done promptly. Additional work effected by sprayground system defects including but not limited to utilities, planting, site stonework, and concrete paving shall be the financial responsibility of the Contractor.
- B. Guarantee shall include spring start-up and winterizing of system within the two (2) year time. Winter damage due to improper winterization is the responsibility of the Contractor.
- C. All repairs and servicing required shall be made under the observation of the Owner's maintenance staff. The Contractor shall include training to Owner staff at these times.

PRODUCTS

1.8 GENERAL

- A. Provide new piping materials and factory-fabricated piping products of sizes, types, pressure ratings and capacities as required by manufacturer to install sprayground system.
- B. Contractor is responsible for the design and installation of the system. Landscape Architect and Owner will review submittals and provide information as necessary to assist Contractor in development of system.
- C. All work shall be in compliance with applicable codes and regulations. The Contractor is responsible to obtain required permits and coordination of inspections.

1.9 MANUFACTURERS

Sprayground Features – Waterplay Solutions Corp., Local Sales Representative: Kevin Umbreit, Recreation Resource, KevinU@Recreation-Resource.com or approved equal.

1.10 SPRAYGROUND FEATURES

- A. Basis of Design:
1. Model: Ground Sprays
 - a. Solo Spurt (4) 0010-7481
 - b. Steady Stream (2) 0010-7484
 - c. Split Spurt (1) 0010-7482
 - d. Confetti Spray (1) 0010-7476

1.11 PIPE

- A. Pipe schedule and material requirements to be provided by manufacturer.

1.12 ACCESSORIES

- A. Sleeves: Sleeves for pipes passing beneath paving shall conform to ASTM D2241. Minimum diameter of 2 inch or 2 sizes larger than pipe scheduled to pass through them.
- B. PVC Solvent Cement: Cement shall conform to ASTM D2564.

1.13 NOZZLES

- A. Nozzles shall be a high-grade synthetic acetal construction
- B. Nozzles shall be installed flush to concrete, eliminating pinch points and trip hazards.

1.14 DRAIN(S)

- A. Basis of Design: Waterplay DRA-000, Sandstone color. Drain size and location shall be coordinated with site storm drainage and utilities.
- B. Drain(s) shall be ADA compliant.
- C. Drain(s) shall be rated for light vehicle traffic.

1.15 CONTROLLER

- A. See contract plumbing drawings for Controller Rainbird *rain sensor* and timer *with Solenoid Valve Connection*.

1.16 WATER SUPPLY

- A. Water supply shall be provided at recessed controls for sprayground as designated on Drawings.

EXECUTION

1.17 EXAMINATION

- A. Examine areas and conditions under which sprayground system materials and products are to be installed. Locate, identify and protect existing and new below-grade utilities.
- B. Make field measurements necessary for Work noting relationship of sprayground work to work of other trades. Coordinate with other trades.
 - 1. Coordinate with Masonry Contractor as required for sleeving through site walls.

Set stakes to identify locations of proposed sprayground system. Obtain Landscape Architect's approval before excavation.

- C. Notify Landscape Architect of any discrepancies between the Contract Documents and field conditions.

- D. Protect plants, walls, slabs and structures, lighting, waterproofing, underdrainage etc., from damage due to work of this Section. Damage to work of another trade shall be reported immediately.
 - E. Prior to installation, receive approval from General Contractor to proceed with construction.
- 1.18 EXCAVATION, BACKFILL AND PIPE ASSEMBLY AND INSTALLATION
- A. Excavate and trench to depths indicated on the Drawings.
 - B. Install sleeves as required prior to installation of pavement and coordinated with installation of segmental retaining walls.
 - C. Backfilling to be done in accordance with Division 2 Section "Earthwork".
 - D. Trenching and Backfilling:
 - 1. Excavate trench to proper depth as shown or specified.
 - 2. Minimum trench width shall be 3 1/2 inches.
 - 3. Over excavate trenches deeper than required in soils containing rock or other hard material that might damage pipe and backfill to proper depth with selected fine earth or sand.
 - 4. Backfill and hand tamp over excavation prior to installing piping.
 - 5. Keep trenches free of obstructions and debris that would damage pipe.
 - 6. Sprayground piping shall not be installed in same trench as heating ducts, electric ducts, storm and sanitary sewer lines, water and gas mains.
 - E. Location and Arrangement: Drawings indicate location and arrangement of piping systems. Install piping as indicated on D-1.7 unless deviations are approved on Coordination Drawings.
 - F. Install piping at minimum uniform slope of 0.5 percent down toward drain valves.
 - G. Install piping free of sags and bends.
 - 1. Snake pipe in trench at least 1 foot per 100 feet of pipe to allow for thermal expansion.
 - H. Install groups of pipes parallel to each other, spaced to permit valve servicing.
 - I. Install fittings for changes in direction and branch connections.
 - J. Install expansion loops in control-valve boxes for plastic piping.
 - K. Lay piping on solid subbase, uniformly sloped without humps or depressions.
 - L. Install PVC piping in dry weather when temperature is above 40 deg F. Allow joints to cure at least 24 hours at temperatures above 40 deg F before testing.
 - M. Install piping in sleeves as indicated on the Drawings.
 - N. No pipe shall be laid when, in the opinion of the Owner, trench or weather conditions are unsuitable. When pipe laying is not in progress, open ends of installed pipe shall be closed by approved means to prevent entrance of trench water and other foreign material into the line. Enough backfill shall be placed in the center sections of the pipe to prevent floating. Any pipe that has floated shall be removed from trench and re-laid.

- O. Record pipe and wire location(s) on record drawings.
- 1.19 SPRAYGROUND FEATURE INSTALLATION
 - A. Install features per manufacturers instructions.
- 1.20 DRAIN(S)
 - A. Drain location(s) shall be coordinated with site storm drainage and utilities.
- 1.21 ELECTRICAL CONNECTIONS AND CONTROL WIRE
 - A. Conform to National Electrical Code (NEC) and local electrical codes.
 - B. Provide electrical connection to system as designated on the Drawings.
- 1.22 IDENTIFICATION
 - A. Identify system components. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplates and signs on each automatic controller.
 - 1. Text: In addition to identifying unit, distinguish between multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.
 - 2. CLEAN UP
 - B. Maintain the site in an orderly condition during the progress of work. Promptly remove debris and trash. Leave the site in a neat, orderly condition, broom clean.
- 1.23 STARTUP SERVICE
 - A. Perform startup service.
 - 1. Complete installation and startup checks according to manufacturer's written instructions.
 - 2. Verify that controllers are installed and connected according to the Contract Documents.
 - 3. Verify that electrical wiring installation complies with manufacturer's submittal.
 - 4. ADJUSTING
 - B. Adjust settings of controllers.
 - C. Adjust automatic control valves to provide flow rate at rated operating pressure required by manufacturer.
 - D. Adjust sprayground system for optimal performance.
- 1.24 MAINTENANCE DURING GUARANTEE PERIOD
 - A. General: Perform procedures set forth in the submitted and approved maintenance program for the duration of Guarantee Period.
 - B. Winterize sprayground system in accordance with manufacturer's recommendations.

1.25 CLOSE OUT

- A. Instruct the Owner's personnel in the proper operation, maintenance, repairs and winterization of the system.
- B. At completion of walk through and instruction of Owner's personnel, Contractor shall insure that the following are complete.
 - 1. Permits required for this work are signed-off by appropriate parties and copies furnished to Owner.
 - 2. Maintenance and Operating Manuals and warranty cards are complete and delivered to Owner, including record drawings and other required items.

PART 2 - END OF SECTION

SECTION 122413 - ROLLER WINDOW SHADES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Manually operated roller shades with single rollers at locations as shown on the drawings.

B. Related Requirements:

1. Section 61053 "Miscellaneous Rough Carpentry" for wood blocking and grounds for mounting roller shades and accessories.
2. Section 079200 "Joint Sealants" for sealing the perimeters of installation accessories for light-blocking shades with a sealant.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, features, finishes, and operating instructions for roller shades.

B. Shop Drawings: Show fabrication and installation details for roller shades, including shadeband materials, their orientation to rollers, and their seam and batten locations.

1. Motor-Operated Shades: Include details of installation and diagrams for power, signal, and control wiring.

C. Samples: For each exposed product and for each color and texture specified, 10 inches (250 mm) long.

D. Samples for Initial Selection: For each type and color of shadeband material.

1. Include Samples of accessories involving color selection.

E. Samples for Verification: For each type of roller shade.

1. Shadeband Material: Not less than 10 inches square. Mark interior face of material if applicable.
2. Roller Shade: Full-size operating unit, not less than 16 inches (400 mm) wide by 36 inches (900 mm) long for each type of roller shade indicated.
3. Installation Accessories: Full-size unit, not less than 10 inches (250 mm) long.

F. Product Schedule: For roller shades.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: For each type of shadeband material.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For roller shades to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Roller Shades: Full-size units equal to 5 percent of quantity installed for each size, color, and shadeband material indicated, but no fewer than [two] <Insert number> units.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roller shades in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not install roller shades until construction and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Products: Subject to compliance with requirements, provide the following products by MechoShade Systems, Inc.:
 - 1. Manually Operated Shades: ManualShade System.
 - 2. Front Fascia: Snap-Loc Fascia.
 - 3. Ceiling Pockets:
 - a. Single roller application: 4124 Pocket
- B. Comparable Products: Subject to compliance with requirements, provide the basis-of-design products indicated, or comparable products by one of the following:
 - 1. Draper Inc.
 - 2. Hunter Douglas Contract.
 - 3. Lutron Electronics Co., Inc.
 - 4. Nysan Solar Control Inc.; Hunter Douglas Company.
- C. E. Source Limitations: Obtain roller shades from single source from single manufacturer.

2.2 MANUALLY OPERATED SHADES WITH SINGLE ROLLERS:

- A. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.
 - 1. Bead Chains: Manufacturer's standard.
 - a. Loop Length: Full length of roller shade.
 - b. Limit Stops: Provide upper and lower ball stops.
 - c. Chain-Retainer Type: Chain tensioner, jamb mounted.
 - 2. Spring Lift-Assist Mechanisms: Manufacturer's standard for balancing roller shade weight and for lifting heavy roller shades.
 - a. Provide for shadebands that weigh more than 10 lb or for shades as recommended by manufacturer, whichever criterion is more stringent.
- B. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.
 - 1. Roller Drive-End Location: As approved by Architect to suit operation and condition of installation.
 - 2. Direction of Shadeband Roll: Regular, from back (exterior face) of roller.
 - 3. Shadeband-to-Roller Attachment: Manufacturer's standard method.
- C. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.
- D. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join up to three inline rollers into a multiband shade that is operated by one roller drive-end assembly.
- E. Shadebands:
 - 1. Shadeband Material: Light-filtering fabric.
 - 2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
 - a. Type: Exposed with endcaps.
- F. Installation Accessories:
 - 1. Exposed Headbox: Rectangular, extruded-aluminum enclosure including front fascia, top and back covers, endcaps, and removable bottom closure.
 - a. Height: Manufacturer's standard height required to enclose roller and shadeband assembly when shade is fully open.
 - 2. Recessed Shade Pocket: Rectangular, extruded-aluminum enclosure designed for recessed ceiling installation; with front, top, and back formed as one piece, end plates, and removable bottom closure panel.
 - a. Height: Manufacturer's standard height required to enclose roller and shadeband assembly when shade is fully open.

- b. Provide pocket with lip at lower edge to support acoustical ceiling panel
3. Installation Accessories Color and Finish: As selected from manufacturer's full range

2.3 SHADEBAND MATERIALS

- A. Shadeband Material Flame-Resistance Rating: Comply with NFPA 701. Testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- B. Light-Filtering Fabric: Woven fabric, stain and fade resistant.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide MechoShade Systems, Inc.; Chelsea 0253
 - 2. Source: Roller-shade manufacturer.
 - 3. Type: PVC-free thermoplastic olefin.
 - 4. Weave: Basketweave.
 - 5. Openness Factor: 3 percent.
 - 6. Color: Graphite.
- C. Light-Blocking Fabric: Opaque fabric, stain and fade resistant.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide MechoShade Systems, Inc.; Equinox Blackout, 0100 Series.
 - 2. Source: Roller-shade manufacturer.
 - 3. Type: PVC-free fiberglass with acrylic backing.
 - 4. Features: Washable. Color: As selected by Architect from manufacturer's full range.

2.4 ROLLER SHADE FABRICATION

- A. Product Safety Standard: Fabricate roller shades to comply with WCMA A 100.1, including requirements for flexible, chain-loop devices; lead content of components; and warning labels.
- B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F (23 deg C):
 - 1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which shade is installed less 1/4 inch (6 mm) per side or 1/2-inch (13-mm) total, plus or minus 1/8 inch (3.1 mm). Length equal to head-to-sill or -floor dimension of opening in which shade is installed less 1/4 inch (6 mm), plus or minus 1/8 inch (3.1 mm).
 - 2. Outside of Jamb Installation: Width and length as indicated, with terminations between shades of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.
- C. Shadeband Fabrication: Fabricate shadebands without battens or seams to extent possible, except as follows:
 - 1. Vertical Shades: Where width-to-length ratio of shadeband is equal to or greater than 1:4, provide battens and seams at uniform spacings along shadeband length to ensure shadeband tracking and alignment through its full range of movement without distortion of the material.
 - 2. Railroaded Materials: Railroad material where material roll width is less than the required width of shadeband and where indicated. Provide battens and seams as required by railroaded material to produce shadebands with full roll-width panel(s) plus, if required, one partial roll-width panel located at top of shadeband.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, locations of connections to building electrical system, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ROLLER SHADE INSTALLATION

- A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions.
 - 1. Opaque Shadebands: Located so shadeband is not closer than 2 inches (51 mm) to interior face of glass. Allow clearances for window operation hardware.
- B. Electrical Connections: Connect motor-operated roller shades to building electrical system.
- C. Roller Shade Locations:
 - 1. Manual Shades: All classroom windows
 - 2. Motorized Shades: All Multi-purpose room windows

3.3 ADJUSTING

- A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.4 CLEANING AND PROTECTION

- A. Clean roller shade surfaces, after installation, according to manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.
- C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

3.5 DEMONSTRATION

Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain motor-operated roller shades.

END OF SECTION

SECTION 123600 - COUNTERTOPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid surface material countertops, including backsplashes, end splashes, and apron fronts
2. Modular stainless steel countertops

B. Related Requirements:

1. Section 064100 "Architectural Casework"

1.2 ACTION SUBMITTALS

A. Product Data: For countertop materials and sinks.

B. Shop Drawings: For countertops. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.

1. Show locations and details of joints.
2. Show direction of directional pattern, if any.

C. Samples for Initial Selection: For each type of material exposed to view.

D. Samples for Verification: For the following products:

1. Countertop material, 6 inches (150 mm) square.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For solid surface material countertops to include in maintenance manuals. Include Product Data for care products used or recommended by Installer and names, addresses, and telephone numbers of local sources for products.

1.5 QUALITY ASSURANCE

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

B. Installer Qualifications: Fabricator of countertops.

1.6 FIELD CONDITIONS

- A. Field Measurements: Verify dimensions of countertops by field measurements after base cabinets are installed but before countertop fabrication is complete.

1.7 COORDINATION

- A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

PART 2 - PRODUCTS

2.1 MODULAR STAINLESS-STEEL COUNTERTOPS

- A. Factory fabricated stainless steel countertops, including legs and wall brackets
 - 1. Basis-of-Design Manufacturers: Just Manufacturing, or comparable product
- B. Materials: Components fabricated from 16 gauge, T304 stainless steel sheet conforming to ASTM A240. All exposed surfaces polished to a No. 4 brushed stain finish
- C. Configuration: Provide straight or L-shaped sections as shown on the drawings with factory cut holes for fixtures
- D. Edge Shape: Standard deck with raised edge.
- E. Legs: Stainless steel tubular legs with fully enclosed gussets and adjustable bullet feet.
- F. Wall Brackets: Manufacturer's standard stainless steel brackets and wall clips

2.2 SOLID SURFACE COUNTERTOP MATERIALS

- A. Solid Surface Material: Homogeneous-filled plastic resin complying with ICPA SS-1.
 - 1. Basis-of-Design Manufacturers: Subject to compliance with requirements, provide Meganite, Inc. or a comparable product by one of the following:
 - a. Formica Corporation. Formica Corporation.
 - b. LG Chemical, Ltd.
 - c. Corian, duPont
 - 2. Type: Provide Standard type.
 - 3. Colors and Patterns: As selected by Architect from manufacturer's full range.

2.3 COUNTERTOP FABRICATION

- A. Fabricate countertops according to solid surface material manufacturer's written instructions and to the AWI/AWMAC/WI's "Architectural Woodwork Standards."
 - 1. Grade: Custom.
- B. Configuration:

1. Front: Straight, slightly eased at top.
 2. Backsplash: Straight, slightly eased at corner.
 3. End Splash: Matching backsplash.
- C. Countertops: 1/2-inch- (19-mm-)] thick, solid surface material with front edge built up with same material.
- D. Backsplashes: 1/2-inch-thick, solid surface material.
- E. Fabricate tops with shop-applied edges and backsplashes unless otherwise indicated. Comply with solid surface material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.
1. Fabricate with loose backsplashes for field assembly.
 2. Install integral sink bowls in countertops in the shop.
- F. Joints: Fabricate countertops without joints.
- G. Cutouts and Holes:
1. Undercounter Plumbing Fixtures: Make cutouts for fixtures in shop] using template or pattern furnished by fixture manufacturer. Form cutouts to smooth, even curves.
 - a. Provide vertical edges, slightly eased at juncture of cutout edges with top and bottom surfaces of countertop and projecting 3/16 inch (5 mm) into fixture opening.
 - b. Provide vertical edges, rounded to 3/8-inch (10-mm) radius at juncture of cutout edges with top surface of countertop, slightly eased at bottom, and projecting 3/16 inch (5 mm) into fixture opening.
 - c. Provide 3/4-inch (20-mm) full bullnose edges projecting 3/8 inch (10 mm) into fixture opening.
 2. Counter-Mounted Plumbing Fixtures: Prepare countertops in shop for field cutting openings for counter-mounted fixtures. Mark tops for cutouts and drill holes at corners of cutout locations. Make corner holes of largest radius practical.
 3. Fittings: Drill countertops in shop for plumbing fittings, undercounter soap dispensers, and similar items.

2.4 INSTALLATION MATERIALS

- A. Adhesive: Product recommended by solid surface material manufacturer.
- B. Sealant for Countertops: Comply with applicable requirements in Section 079200 "Joint Sealants."

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

- A. Install countertops level to a tolerance of 1/8 inch in 8 feet (3 mm in 2.4 m), 1/4 inch (6 mm) maximum. Do not exceed 1/64-inch (0.4-mm) difference between planes of adjacent units.
- B. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Predrill holes for screws as recommended by manufacturer. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
- C. Fasten subtops to cabinets by screwing through subtops into cornerblocks of base cabinets. Shim as needed to align subtops in a level plane.
- D. Secure countertops to subtops with adhesive according to solid surface material manufacturer's written instructions. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
- E. Bond joints with adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to joints to prevent adhesive smears.
 - 1. Install metal splines in kerfs in countertop edges at joints[where indicated]. Fill kerfs with adhesive before inserting splines and remove excess immediately after adjoining units are drawn into position.
 - 2. Clamp units to temporary bracing, supports, or each other to ensure that countertops are properly aligned and joints are of specified width.
- F. Install backsplashes and end splashes by adhering to wall and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears.
- G. Install aprons to backing and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears. Fasten by screwing through backing. Predrill holes for screws as recommended by manufacturer.
- H. Anchoring to In-Place Construction: Use anchors and fasteners where necessary to secure wall-supported counters to structural support and to properly transfer load to in-place construction.
- I. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.
 - 1. Seal edges of cutouts in particleboard subtops by saturating with varnish.
- J. Apply sealant to gaps at walls; comply with Section 079200 "Joint Sealants."

END OF SECTION

SECTION 124813 - ENTRANCE FLOOR MATS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Roll-up rail entrance mats.
 - 2. Recessed frames.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show layout of entrance mats in relation to other construction, and the following:
 - 1. Items penetrating floor mats and frames
 - 2. Divisions between mat sections.
 - 3. Layout of floor mats including direction of traffic
 - 4. Profiles and accessories
- C. Samples: For each floor mat

1.3 CLOSEOUT SUBMITTALS

- A. Maintenance data.

PART 2 - PRODUCTS

2.1 ENTRANCE FLOOR MATS AND FRAMES, GENERAL

- A. Structural Performance: Provide floor mats and frames capable of withstanding a wheel load of 1,000 lb per wheel.
- B. Accessibility Standard: Comply with applicable provisions in the DOJ's "2010 ADA Standards for Accessible Design" and ICC A117.1.

2.2 ROLL-UP RAIL MATS MAT1

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Mats Inc; Grate Mat XT or a comparable product by one of the following:
 - 1. Balco, Inc.
 - 2. C/S Group.
 - 3. Kadee Industries, Inc.
 - 4. Pawling Corporation; Architectural Products Division.
 - 5. Reese Enterprises, Inc.
- B. Construction: recessed extruded aluminum 6063-T52 allow frame with carpet inserts.
 - 1. Insert Color: Charcoal.

2. System Thickness: 3/4 inch (19mm).

2.3 FABRICATION

- A. Floor Mats: Shop fabricate units to greatest extent possible in sizes indicated. Unless otherwise indicated, provide single unit for each mat installation; do not exceed manufacturer's recommended maximum sizes for units that are removed for maintenance and cleaning. Where joints in mats are necessary, space symmetrically and away from normal traffic lanes. Miter corner joints in framing elements with hairline joints or provide prefabricated corner units without joints.
- B. Coat concealed surfaces of aluminum frames that contact cementitious material with manufacturer's standard protective coating.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install recessed mat frames to comply with manufacturer's written instructions. Set mat tops at height recommended by manufacturer for most effective cleaning action; coordinate tops of mat surfaces with bottoms of doors that swing across mats to provide clearance between door and mat.

3.2 PROTECTION

- A. After completing frame installation and concrete work, provide temporary filler of plywood or fiberboard in recesses and cover frames with plywood protective flooring. Maintain protection until construction traffic has ended and Project is near Substantial Completion.

END OF SECTION

SECTION 126613 - TELESCOPING GYM SEATING

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included: The Work of this Section shall include, but not be limited to, the following:

1. Wall- attached telescoping gym seating.

1.2 SYSTEM DESCRIPTION

A. Telescoping Gym Seating: power-operated system of multiple-tiered seating rows comprising seats, deck components, and understructure that permits closing into a nested configuration without requiring dismantling, for storing or for moving purposes.

1.3 SUBMITTALS

A. Shop Drawings: Indicate telescoping gym seat assembly layout. Show seat heights, row spacing and rise, aisle widths and locations, assembly dimensions, anchorage to supporting structure, material types and finishes.

1. Graphics Layout Drawings: Indicate logo pattern of contrasting or matching seat colors.

B. Delegated-Design Submittal: For telescoping gym seating.

1. For installed products indicated to comply with design loads, provide the following signed and sealed by the qualified Professional Engineer, licensed in the State of New Jersey, responsible for their preparation:

- a. Shop drawings,
- b. Calculations and structural analysis data.

C. Samples: Seat materials and color finish as selected by Architect from manufacturer's standard color finishes.

D. Installer Qualifications: Installer qualifications indicating capability, experience, and official Certification Card issued by manufacturer of telescopic seating.

E. Operating/Maintenance Manuals: Provide maintenance manuals to Owner.

1. Demonstrate operating procedures, recommended maintenance and inspection program.

F. Warranty: Manufacturer's standard warranty documents.

1.4 QUALITY ASSURANCE

G. Installer Qualifications: Engage manufacturer's Certified Installers or an experienced Installer approved by the manufacturer, who has specialized in installation of telescoping gym seat types similar to those required for this project.

H. Seating Layout: Comply with current NFPA 102 Standard for Assembly Seating, Tents, and Membrane Structures, and specifically with Folding and Telescopic Seating, except where additional requirements are indicated or imposed by authorities having jurisdiction.

I. Welding Standards & Qualification: Comply with AWS D1.1 Structural Welding Code

1. Steel and AWS D1.3 Structural Welding Code - Sheet Steel.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver telescopic gym seats in manufacturers packaging clearly labeled with manufacturer name and content.

B. Handle seating equipment in a manner to prevent damage.

C. Deliver the seating at a scheduled time for installation that will not interfere with other trades operating in the building.

1.6 PROJECT CONDITIONS

A. Field Measurements: Coordinate actual dimensions of construction affecting telescoping bleachers installation by accurate field measurements before fabrication. Show recorded measurements on final shop drawings.

A. Coordinate field measurements and fabrication schedule with construction progress to avoid delay of Work.

1.7 WARRANTY

A. Manufacturer's Product Warranty: Submit manufacturer's standard warranty form for telescoping bleachers. This warranty is in addition to, and not a limitation of, other rights Owner may have under Contract Documents.

1. Warranty Period: Five years from Date of Acceptance. PART 2

- PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Engineer, fabricate and install telescopic gym seating systems to the following structural loads without exceeding allowable design working stresses of materials involved, including anchors and connections.

1. Design Loads: Comply with NFPA 102 for design loads and Building Code.

2. Apply each load to produce maximum stress in each respective component of each gym seat unit.

B. System Design Criteria:

1. Gymnasium Seat Assembly: Design to support and resist, in addition to its own weight, the following forces:

- a. Live load of 120 lbs. per linear foot on seats and decking.
 - b. Uniformly distributed live load of not less than 100 lbs. per sq. ft. of gross horizontal projection.
 - c. Parallel sway load of 24 lbs. per linear foot of row combined with uniformly distributed live load.
 - d. Perpendicular sway load of 10 lbs. per linear foot of row combined with uniformly distributed live load.
2. Hand Railings, Posts and Supports: Engineered to withstand the following forces applied separately:
 - a. Concentrated load of 200 lbs. applied at any point and in any direction.
 - b. Uniform load of 50 lbs. per foot applied in any direction.
 3. Guard Railings, Post and Supports: Engineered to withstand the following forces applied separately:
 - a. Concentrated load of 200 lbs. applied at any point in any direction along top rail.
 - b. Uniform load of 50 lbs. per foot applied horizontally at top rail and a simultaneous uniform load of 100 lbs. per foot applied vertically downward.
 4. Member Sizes and Connections: Design criteria (per current edition) of the following shall be the basis for calculation of member sizes and connections:
 - a. AISC: Manual of Steel Construction.
 - b. AISI: Specification for Design of Cold Formed Steel Structural Members.
 - c. AA: Specification for Aluminum Structures.
 - d. NFOPA: National Design Guide for Wood Construction.

2.2 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide materials from the following or equal as approved by the Architect:
 1. Model: Universal, closed-deck telescopic bleachers as supplied by Interkal LLC.
 - a. Seat: 10-inch module; plastic.
 - b. Operation: Automatic, friction-type integral power unit.
 2. Description:
 - a. Row to Row Spacing: 24-inch.
 - b. Rise per Row: 10-1/4 inch.
 - c. Operation: Pendant control.
 3. Handicapped Seating: Comply with ANSI 117.1. Provide 36-inch-wide wheelchair space as required.
- B. Other Manufacturers:
 1. Hussey Seating Company.
 2. Irwin Folding Bleacher Company.

2.2 MATERIALS

- A. Lumber: ANSI/Voluntary Product 20, B & B Southern Pine.
- B. Plywood: ANSI/Voluntary Product PS1, APA A-C Exterior Grade.
- C. Structural Steel Shapes, Plates and Bars: ASTM A 36.
- D. Uncoated Steel Strip (Non-Structural Components): ASTM A 569, Commercial Quality, Hot-Rolled Strip.
- E. Uncoated Steel Strip (Structural Components): ASTM A 570 Grade 33, 40, 45, or 50, Structural Quality, Hot-Rolled Strip.
- F. Uncoated Steel Strip (Structural Components): ASTM A 607 Grade 45 or 50, High- Strength, Low Alloy, Hot-Rolled Strip.
- G. Galvanized Steel Strip: ASTM A 653 Grade 40, zinc coated by the hot-dip process, structural quality.
- H. Structural Tubing: ASTM A 500 Grade B, cold-formed.
- I. Polyethylene Plastic: ASTM D 1248, Type III, Class B; molded, color-pigmented, textured, impact-resistant, structural formulation; in two colors as selected by Architect from manufacturers full range of custom and standard colors.
- J. Fasteners: Vibration-proof, of size and material standard with manufacturer.

2.3 ACCESSORIES

- A. Foot Level Aisles: Provide footrest level aisles at locations and dimensions shown on plans and approved Shop Drawings.
 - 1. Center Aisle: Provide a permanently attached self-storing aisle rail; bleachers without self-storing aisle rail are not acceptable.
 - 2. Intermediate Steps: Provide manufacturer's standard intermediate step as necessary per applicable code.
 - 3. Last Row Closure: Provide flush-mounted rear closure board between the last row of the bleacher and the wall.
- B. Front Railing: Provide rigid 36inch high fixed tubular steel rail with vertical intermediated members to fill design criteria. Rail shall be mounted full width at two row deep ADA wheelchair accommodations. Finish shall be polyester powder coat. Front rails shall be designed to comply with all applicable codes and remain consistent with all other rails, and not allow clearance of a 4" sphere.
- C. End Railing: Provide self-storing steel end rails, 42 inches high with tubular supports and vertical intermediate members to comply with all code requirements. Rails shall be fitted to each exposed bank end from third row and above with all steel-to-steel connections. Finish shall be a polyester powder coat.
 - 1. Provide removable end rails for handicapped locations.

- D. Numbering: Provide seat numbers and row letters for sculpture seat modules. Sequence shall be as determined by the Architect.
- E. Vinyl End Curtains: Provide manufacturer's standard vinyl end curtains to close off under the bleacher units in the extended position. Curtain color shall be selected by the Architect from manufacturer's complete range of standard and custom colors.
- F. Removable pads on bleachers in closed position.

2.4 FABRICATION

A. Frame System:

1. Continuous Wheel Channel: Wheel channels shall consist of a one-piece formed steel channel welded to the base of a vertical column. Every row of each section shall be fitted with not less than eight wheel under each moving row for rows 1 through 10, ten wheels under each moving row for rows 11 through 15 and twelve wheels starting with row 16.
2. Wheels: 3-1/2 inch diameter by 1 1/8 inch with non-marring soft rubber face to protect wood and synthetic floor surfaces, with molded-in sintered iron oil-impregnated bushings to fit 1/2 inch diameter axles secured with E-type snap rings.
3. Columns: Electrically welded closed rectangular steel tube, 14 gauge steel fitted with a rear welded gusset at the wheel channel.
4. Row Interlocks: Join each row structure front to rear by means of two interacting steel connections, and automatic gravity row locks where engineering calculations determine that they are required.
5. Lower Track: Lower track guide shall be an external super slide rod to guarantee positive engagement of vertical supports without binding and assures smooth operation over uneven floor conditions.
6. Upper Track: Upper track guide shall completely interlock adjacent understructure support. Provide a welded stop to ensure correct extension of bleacher unit on deck support; use of bolt and nut stops is not acceptable.
7. Diagonal Braces: Structural formed steel truss fitted to Row 3 and beyond. Bracing shall be attached to the rear riser and designed and shaped to support a minimum load of 1000 lbs. of both compression and tension forces created when the bleacher is loaded.
8. Deck Support: 11-gauge structural steel member spaced not greater than 5 feet on center. Provide a minimum of five integral nylon rollers on deck supports per section, per row.
9. Decking: 19/32-inch nominal Douglas Fir BC grade plywood with exterior glue and solid brass crossbands. An extruded aluminum H-connector shall be placed between plywood panels. Exposed wear surfaces shall be finished with a layer of high-density polyethylene plastic.
 - a. Color selected by the Architect.
10. Nose Beam: One-piece 13-gauge galvanized steel.
11. Rear Riser: One-piece formed 14-gauge, grade 50, galvanized steel with a continuous access joint to full engage footrest panel.
12. Splice Plates: Each section shall be tied together with two structural steel members per row, employing a minimum of four steel to steel through bolt connections at the nose beam and a minimum of eight steel to steel through

bolt connections at the lower steel rear riser. Gauge of splice plates to match the gauge of the nose beam and rear riser. Splice plates employing steel to plywood deck board attachments will not be acceptable.

- B. Welds: Performed by welders certified by AWS standards for the process employed. C. Structural Connections: SAE. Grade 5 or better stress-rated bolts.

2.5 SHOP FINISHES

- A. Understructure: For rust resistance, steel understructure shall be finished on all surfaces with black "Dura-Coat" enamel. Understructure finish shall contain a silicone additive to improve scratch resistance of finish.
- B. Wear Surfaces: Surface subject to normal wear by spectators shall have a finish that does not wear to show different color underneath:
 - 1. Steel nosing and rear risers shall be galvanized with a minimum spangle of G-60 zinc plating.
 - 2. Wood surfaces shall have a sealer coat and wear-resistant high gloss clear urethane finish.
 - 3. Colors: As selected by the Architect from manufacturer's full range of standard and custom colors.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions: Verify areas to receive telescoping gym seats are free of impediments interfering with installation and condition of installation substrates are acceptable to receive telescoping gym seats in accordance with telescoping gym seats manufacturer's recommendations.
- B. Do not commence installation until conditions are satisfactory.

3.2 INSTALLATION

- A. Comply with telescoping gym seats manufacturer's recommendations for product installation.

3.3 ADJUSTMENT AND CLEANING

- A. Adjustment: After installation completion, test and adjust each telescoping gym seats assembly to operate in compliance with manufacturer's operations manual.
- B. Cleaning: Clean installed telescoping gym seats on both exposed and semi-exposed surfaces. Touch-up finishes to restore damage or soiled surfaces.

3.4 PROTECTION

- A. General: Provide final protection and maintain conditions, in a manner acceptable to manufacturer and installer to ensure telescoping gym seats are without damage or deterioration at time of substantial completion.

END OF SECTION

SECTION 129300 - SITE FURNISHINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

1. Bench – backless and backed
2. Trash Receptacle
3. Bike Rack
4. Game Table
5. Pedestal Picnic Table
6. Drinking Fountain
7. Bollard
8. Tool Locker (ALTERNATE 2)
9. ADA Accessible Planter (ALTERNATE 2)

- B. Related Requirements:

1. Section 321613 "Cast-in-Place Concrete" for installing equipment and/or anchor bolts cast in concrete footings.
2. Section 312000 "Earth Moving" for excavation for installing concrete footings.

1.3 ACTION SUBMITTALS

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

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For site furnishings to include in maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Anchors, Fasteners, Fittings, and Hardware: Provide Stainless steel; commercial quality, tamperproof, vandal and theft resistant unless indicated otherwise on the Drawings.

- B. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107; recommended in writing by manufacturer, for exterior applications.
- C. Erosion-Resistant Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with potable water at Project site to create pourable anchoring, patching, and grouting compound; resistant to erosion from water exposure without needing protection by a sealer or waterproof coating; recommended in writing by manufacturer, for exterior applications.

2.2 BENCHES

- A. Basis-of-Design Product: Subject to compliance with requirements, provide furnishings manufactured by Dumor, Inc., P.O. Box 142, Mifflintown, PA 17059, 717-436-2106 or 800-598-4018, www.dumor.com, or approved comparable product.
 - 1. Backless Model: 164-60
 - 2. Backed Model: 160-60
 - 3. Finish / Color: Powdercoat / Black.
 - 4. With center arm and 'Fairmount Park' security panel.
 - 5. Mount: As shown on Drawings.

2.3 TRASH RECEPTACLE

- A. Basis-of-Design Product: Subject to compliance with requirements, provide furnishings manufactured by Dumor, PO Box 142, Mifflintown, PA 17059, 1-800-598-4018, or approved comparable product.
 - 1. Model: 157-32-FTO
 - 2. Finish / Color: Powdercoat / Black.
 - 3. Mount: As shown on Drawings.

2.4 BIKE RACK

- A. Basis-of-Design Manufacturer: Subject to compliance with requirements, provide furnishings manufactured by Dumor, PO Box 142, Mifflintown, PA 17059, 1-800-598-4018, or approved comparable product.
 - 1. Model: 83, embedded mounting option.
 - 2. Finish / Color: Black Powdercoat.

2.5 GAME TABLE

- A. Basis-of-Design Manufacturer: Subject to compliance with requirements, provide furnishings manufactured by Dumor, Inc., P.O. Box 142, Mifflintown, PA 17059, 717-436-2106 or 800-598-4018, www.dumor.com, or approved comparable product.
 - 1. Model: 78-32PL-S-1
 - 2. Material: Steel and Recycled Plastic
 - 3. Mount: As shown on drawings

4. Steel Finish/Color: Powdercoat/Black
5. Recycled Plastic Color: TBD

2.6 PEDESTAL PICNIC TABLE

- A. Basis-of-Design Manufacturer: Subject to compliance with requirements, provide furnishings manufactured by Dumor, Inc., P.O. Box 142, Mifflintown, PA 17059, 717-436-2106 or 800-598-4018, www.dumor.com, or approved comparable product.
1. Model: 76-34PL AND 76-33PL
 2. Material: Steel and Recycled Plastic
 3. Mount: As shown on drawings
 4. Steel Finish/Color: Powdercoat/Black
 5. Recycled Plastic Color: TBD

2.7 DRINKING FOUNTAIN & BOTTLE FILLING STATION

- A. Basis-of-Design Manufacturer: Subject to compliance with requirements, provide furnishings manufactured by Elkay, 1333 Butterfield Road Ste. 200, Downers Grove, IL 60515, (630) 574-8484, www.elkay.com, or approved comparable product.
1. Model: LK4420BF1UFRK
 2. Finish / Color: Black

2.8 Bollard

- A. Basis-of-Design Manufacturer: Subject to compliance with requirements, provide furnishings manufactured by Dumor, Inc., P.O. Box 142, Mifflintown, PA 17059, 717-436-2106 or 800-598-4018, www.dumor.com, or approved comparable product.
1. Model: 400-42, S-1
 2. Finish / Color: Black

2.9 Tool Locker

- A. Basis-of-Design Manufacturer: Subject to compliance with requirements, provide furnishings manufactured by Northern Tool, www.northerntool.com, or approved comparable product.
1. Model: TuffBoxx DockBoxx Storage Container, 75x27x19, #453-017-8003.
 2. Finish / Color: Black

2.10 ADA Accessible Planter (ALTERNATE)

- A. Basis-of-Design Manufacturer: Subject to compliance with requirements, provide furnishings manufactured by Accessible Gardens, 2 Cleo Court, Westerly, RI 02891, (401) 290-7870, www.accessiblegardens.com, or approved comparable product.
1. Model: ADA-Compliant Forward Facing Wheelchair Garden
 2. Size: 47"Lx45"Wx24"to30"H.
 3. Material: Red Cedar

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION, GENERAL

- A. Comply with manufacturer's written installation instructions unless more stringent requirements are indicated. Complete field assembly of site furnishings where required.
- B. Unless otherwise indicated, install site furnishings after landscaping and paving have been completed.
- C. Install site furnishings level, plumb, true, and **securely anchored** at locations indicated on Drawings.
- D. Post Setting: Set cast-in support posts in concrete footing with smooth top, shaped to shed water. Protect portion of posts above footing from concrete splatter. Verify that posts are set plumb or at correct angle and are aligned and at correct height and spacing. Hold posts in position during placement and finishing operations until concrete is sufficiently cured.
- E. Pipe Sleeves: Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions, with top smoothed and shaped to shed water.

3.3 CLEANING

- A. After completing site furnishing installation, inspect components. Remove spots, dirt, and debris. Repair damaged finishes to match original finish or replace component.

END OF SECTION

SECTION 142100 – ELECTRIC TRACTION ELEVATORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Electric Traction Elevators.

B. Products Supplied but Not Installed Under this Section:

1. Hoist Beam
2. Pit Ladder
3. Inserts mounted in block walls for rail attachments

C. Work Supplied Under Other Sections:

1. Temporary lighting, including temporary lighting in hoistway for machine space with switch located in hoistway on the strike jamb side of top landing door.
2. Main line disconnects for each elevator.
 - a. One fused three phase permanent power in building electrical distribution room
3. Hoistway ventilation shall be in accordance with local and national building code requirements.
4. Guide Rail Support shall be structurally adequate to extend from pit floor to top of hoistway, with spans in accordance with requirements of authority having jurisdiction and final layouts.
5. Removable barricades at all hoistway openings, in compliance with OSHA 29 CFR 1926.502 in addition to any local code requirements.
6. Lifeline attachments capable of withstanding 5000 lb load in accordance with OSHA 29 CFR 1926.502. Provide a minimum of 2 at the top, front of each hoistway.
7. Pit lighting: Fixture with switch and guards. Provide illumination level equal to or greater than that required by ASME A17.1/CSA B44 2000, or applicable version.
8. Control space lighting with switch. Coordinate switch with lighting for machine space as allowable by code.
9. Access Doors: As required for access to governor and/or seismic switch. Access door shall be self-closing, self-locking if necessary and operable from the inside without a key.

D. Related sections:

1. Section 015000 – Temporary Facility and Controls
2. Section 033000 - Cast-in-Place Concrete:
3. Section 042000 – Concrete Unit Masonry
4. Section 055000 - Metal Fabrications
5. Section 230000 - Heating, Ventilating, and Air Conditioning
6. Section 260000 - Electrical
7. Section 263000 - Electric Power Generating and Storing Equipment
8. Section 273000 - Voice Communications

9. Section 283100 - Fire Detection and Alarm
10. Section 310000 – Earthwork

E. Industry and government standards:

1. ICC/ANSI A117.1 Accessible and Usable Buildings and Facilities
2. ADAAG - Accessibility Guidelines for Buildings and Facilities
3. ANSI/NFPA 70, National Electrical Code
4. ANSI/NFPA 80, Standard for Fire Doors and Fire Windows
5. ASME/ANSI A17.1, Safety Code for Elevators and Escalators.

1.2 DESCRIPTION OF ELEVATOR

- A. Elevator Equipment Basis-of-Design: Kone MonoSpace® 300 gearless traction elevator
- B. Equipment Control: KCM831
- C. Drive: Non Regenerative
- D. Quantity of Elevators: 1 Elevator
- E. Landings: 3
- F. Openings: 3 Front Openings, 0 Back Openings
- G. Travel: 38'-6"
- H. Rated Capacity: 2,000 lb
- I. Rated Speed: 150 FPM
- J. Clear Inside Dimensions: (W x D) 5' 9" x 4' 1/2"
- K. Cab Height: 7'-6"
- L. Clear height under suspended ceiling: 7'-4"
- M. Entrance Width and Type: 36" and Left Opening
- N. Entrance Height: 7'-0"
- O. Main Power Supply: 480 V Volts + 5%, three-phase
- P. Operation: Simplex
- Q. Machine Location: Inside the hoistway mounted on car guide rail
- R. Control Space Location: Integrated control
- S. Elevator Equipment shall conform to the requirements of seismic zone: Non-Seismic
- T. Maintenance Service Period: 12 Months

1.3 PERFORMANCE REQUIREMENTS

A. Car Performance

1. Car Speed \pm 5% of contract speed under any loading condition or direction of travel.
2. Car Capacity: Safely lower, stop and hold (per code) up to 125% of rated load.

B. System Performance

1. Vertical Vibration (maximum): ISO 18738/ISO 8041 system pk-pk 15 mg
2. Horizontal Vibration (maximum): ISO 18738/ISO 8041 system pk-pk 12 mg

3. Jerk Rate (maximum): 1 m/s³
4. Acceleration (maximum): 0.4 m/s²
5. In Car Noise: 55 dB(A) Maximum
6. Leveling Accuracy: ±0.2 inches
7. Starts per hour (maximum): 180

1.4 SUBMITTALS

A. Comply with Section 01 33 00 - Submittal Procedures.

B. Product Data: Submit manufacturer's product literature for each proposed system.

1. Cab design, dimensions and layout.
2. Layout, finishes, and accessories and available options.
3. Controls, signals and operating system.
4. Color selection charts for cab and entrances.

C. Shop Drawings:

1. Clearances and travel of car.
2. Clear inside hoistway and pit dimensions.
3. Location and layout of equipment and signals.
4. Car, guide rails, buffers and other components in hoistway.
5. Maximum rail bracket spacing.
6. Maximum loads imposed on building structure.
7. Hoist beam requirements.
8. Location and sizes of access doors.
9. Location and details of hoistway door and frames.
10. Electrical characteristics and connection requirements.

D. Operation and maintenance data:

1. Provide manufacturer's standard maintenance and operation manual.

E. Diagnostic Tools

1. Prior to seeking final acceptance for the completed project as specified by the Contract Documents, the Elevator Contractor shall deliver to the Owner any specialized tool(s) that may be required to perform diagnostic evaluations, adjustments, and/or parametric software changes and/or test and inspections on any piece of control or monitoring equipment installed.
2. This shall include any specialized tool(s) required for monitoring, inspection and/or maintenance where the means of suspension other than conventional wire ropes are furnished and installed by the Elevator Contractor. Any and all such tool(s) shall become property of the Owner. Any diagnostic tool provided to the Owner by the Elevator Contractor shall be configured to perform all levels of diagnostics, systems adjustment and parametric software changes which are available to the Elevator Contractor.

3. In those cases where diagnostic tools provided to the Owner require periodic recalibration/or re-initiation, the Elevator Contractor shall perform such tasks at no additional cost to the Owner for a period equal to the term of the maintenance agreement from the date of final acceptance of the completed project. During those intervals in which the Owner might find it necessary to surrender a diagnostic tool for re-calibration, re-initiation, or repair, the Elevator Contractor shall provide a temporary replacement for the tool at no additional cost to the Owner.
4. The Elevator Contractor shall deliver to the Owner, printed instructions for the proper use of any tool that may be necessary to perform diagnostic evaluations, system adjustment, and/or parametric software changes on any unit of microprocessor-based elevator control equipment and means of suspension other than standard elevator steel cables furnished and install by the Elevator Contractor.
5. Accompanying the printed instructions shall be any and all access codes, password, or other proprietary information that is necessary to interface with the microprocessor-control equipment.

1.5 QUALITY ASSURANCE

- A. Manufacturer: Minimum of fifteen years' experience in the fabrication, installation and service of elevators of the type and performance of the specified. The manufacturer shall have a documented quality assurance program.
- B. Installer: The equipment manufacturer shall install the elevator.
- C. Inspection and Testing: In accordance with requirements of local jurisdiction, obtain required permits, inspections, and tests.

1.6 DELIVERY, STORAGE AND HANDLING

- A. If the construction site is not prepared to receive the elevator equipment at the agreed ship date, the General Contractor shall be responsible for the cost of storage at an approved facility. Additional labor costs for double handling will be the responsibility of the General Contractor.
- B. Delivered elevator materials shall be stored in a protected environment in accordance with manufacturer recommendations. A minimum storage area of 10 feet by 20 feet is required adjacent to the hoistway.

1.7 WARRANTY

- A. Provide manufacturer warranty for a period of one year. The warranty period is to begin upon final acceptance of the Contract. Warranty covers defects in materials and workmanship. Damage due to ordinary use, vandalism, improper or insufficient maintenance, misuse, or neglect do not constitute defective material or workmanship.

1.8 MAINTENANCE SERVICE

- A. The elevator manufacturer shall provide maintenance service consisting of regular examinations and

adjustments of the elevator equipment for a period of 12 Months after date of final acceptance.

Predictive maintenance shall be included for the full maintenance period. This service must be capable of using AI-based analytics to identify potential equipment issues and notifying the elevator provider via an internet connection.

Replacement parts shall be produced by the original equipment manufacturer.

- B. Maintenance service to be performed during regular working hours of regular working days and shall include emergency call back service during regular working hours.
- C. Maintenance service shall not include adjustments, repairs or replacement of parts due to negligence, misuse, abuse or accidents.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Provide AC gearless machine room-less elevator systems subject to compliance with the design and performance requirements of this specification. Elevator manufacturers may include but are not limited to one of the following:
 - 1. Basis of Design: MonoSpace® 300 traction elevators by KONE, Inc. (www.kone.com).
 - 2. Other acceptable machine room-less products: manufacturer with minimum 15 years' experience in manufacturing, installing, and servicing elevators of the type required for the project.

2.2 EQUIPMENT: CONTROL COMPONENTS AND CONTROLSPACE

- A. Controller: Provide microcomputer-based control system to perform all functions.
 - 1. All high voltage (110V or above) contact points inside the controller cabinet shall be protected from accidental contact in a situation where the controller doors are open.
 - 2. Controller shall be separated into two distinct halves; Motor Drive side and Control side. High voltage motor power conductors shall be routed and physically segregated from the rest of the controller.
 - 3. Provide a serial cardrack and main CPU board containing a non-erasable EPROM and operating system firmware.
 - 4. Variable field parameters and adjustments shall be contained in a non-volatile memory module.
- B. Drive: Provide Variable Voltage Variable Frequency AC drive system to develop high starting torque with low starting current.
- C. Controller Location: Locate controller{s} in the front wall integrated with the top landing entrance frame, machine side of the elevator. One non-fused three phase permanent power in hoist way at

top landing. A separate control space should not be required.

2.3 EQUIPMENT: HOISTWAY ENTRANCES

A. Hoistway Entrances

1. Sills: Extruded Aluminum.
2. Doors: Hollow metal construction with vertical internal channel reinforcements.
3. Fire Rating: Entrance and doors shall be UL fire-rated for 1 1/2 hour.
4. Entrance Finish: Brushed Stainless Steel.
5. Entrance Markings Jamb Plates: Provide standard entrance jamb tactile markings on both jambs, at all floors. Plate Mounting: Refer to manufacturer drawings.

2.4 EQUIPMENT: CAR COMPONENTS

- A. Car Frame: Provide car frame with adequate bracing to support the platform and car enclosure.
- B. Car Safeties: Device will be provided and mounted under the car platform, securely bolted to the Car Frame. The safety will be actuated by a centrifugal governor mounted at the top of the hoistway. The Safety is designed to operate in case the car attains excessive descending speed.
- C. Platform: Platform shall be all steel construction.
- D. Car Guides: Provide guide-shoes mounted to top and bottom of both car and counterweight frame. Each guide-shoe assembly shall be arranged to maintain constant contact on the rail surfaces. Provide retainers in areas with Seismic design requirements.
- E. Car Wall Finish:
 1. Side Walls: 304 Brushed Stainless Steel (4SS)
 2. Rear Wall: 441 Brushed Stainless Steel (4SS)
 3. Car front, Door and Skirting: Brushed Stainless Steel
 4. Ceiling: Round, LED spotlights
 5. Handrails: Brushed Stainless Steel
 - a. Rails to be located on of car enclosure.
 6. Sills: Aluminum extruded.
- F. Flooring: By others. (Not to exceed 3lb/sqft and 1/2" finished depth.)
- G. Emergency Car Signals
 1. Emergency Siren: Siren mounted on top of cab that is activated when the alarm button in the car operating panel is engaged. Siren shall have rated sound pressure level of 80 dB(A) at a distance of three feet from device. Siren shall respond with a delay of not more than one

second after activation of alarm button.

2. Emergency Car Lighting: Provide emergency power unit employing a 12- volt sealed rechargeable battery and totally static circuits shall illuminate the elevator car and provide current to the alarm bell in the event of building power failure.
3. Emergency Exit Contact: An electrical contact shall be provided on the car-top exit.

H. Ventilation: Manufacturer's standard cab fan

2.5 EQUIPMENT: SIGNAL DEVICES AND FIXTURES

A. Car Operating Panel: Provide car operating panel with all push buttons, key switches, and message indicators for elevator operation. Fixture finish to be Brushed Stainless Steel

1. Main Flush mounted car operating panel shall contain a bank of round, mechanical, illuminated buttons marked to correspond to landings served, emergency call button, door open button, door close button, and key switches for lights, inspection, and exhaust fan. Buttons have Amber Dot Matrix illumination (halo). All buttons to have raised text and Braille marking on left hand side. The car operating display panel shall be Amber Dot Matrix. All texts, when illuminated, shall be Amber Dot Matrix. The car operating panel shall have a Brushed Stainless Steel finish.
2. Additional features of car operating panel shall include:
 - a. Car Position Indicator within operating panel Brushed Stainless Steel
 - b. Elevator Data Plate marked with elevator capacity and car number on car top.
 - c. Help buttons with raised markings.
 - d. In car stop switch per local code.
 - e. Call Cancel Button.

B. Hall Fixtures: hall fixtures shall be provided with necessary push buttons and key switches for elevator operation. hall fixtures shall have a Brushed Stainless Steel finish.

1. Hall fixtures shall feature round, mechanical, buttons in applied mount face frame. Hall fixtures shall correspond to options available from that landing. Buttons shall be in a vertically mounted fixture.

C. Car Lantern and Chime: A directional lantern visible from the corridor shall be provided in the car entrance. When the car stops and the doors are opening, the lantern shall indicate the direction in which the car is to travel, and a chime will sound. The chime will sound once for up and twice for down. The car riding lantern face plate shall have a Brushed Stainless Steel finish.

2.6 EQUIPMENT: ELEVATOR OPERATION AND CONTROLLER

A. Elevator Operation

1. Simplex Collective Operation: Using a microprocessor-based controller, operation shall be automatic by means of the car and hall buttons. If all calls in the system have been answered, the car shall park at the last landing served.
2. Zoned Car Parking.
3. Relative System Response Dispatching.

B. Standard Operating Features to include:

1. Full Collective Operation
2. Fan and Light Control.
3. Load Weighing Bypass.
4. Ascending Car Uncontrolled Movement Protection
5. Top of Car Inspection Station.

C. Additional Operating Features to include:

D. Elevator Control System for Inspections and Emergency

1. Provide devices within controller to run the elevator in inspection operation.
2. Provide devices on car top to run the elevator in inspection operation.
3. Provide within controller an emergency stop switch to disconnect power from the brake and prevents motor from running.
4. Provide the means from the controller to mechanically lift and control the elevator brake to safely bring car to nearest available landing when power is interrupted.
5. Provide the means from the controller to reset the governor over speed switch and also trip the governor.
6. Provide the means from the controller to reset the emergency brake when set because of an unintended car movement or ascending car over speed.
7. Provide the means for the control to reset elevator earthquake operation.

2.7 EQUIPMENT: DOOR OPERATOR AND CONTROL

A. Door Operator: A closed loop permanent magnet VVVF high-performance door operator shall be provided to open and close the car and hoistway doors simultaneously. Door movement shall be cushioned at both limits of travel. Electro-mechanical interlock shall be provided at each hoistway entrance to prevent operation of the elevator unless all doors are closed and locked. An electric contact shall be provided on the car at each car entrance to prevent the operation of the elevator unless the car door is closed.

B. The door operator shall be arranged so that, in case of interruption or failure of electric power, the doors can be readily opened by hand from within the car, in accordance with applicable code.

Emergency devices and keys for opening doors from the landing shall be provided as required by local code.

- C. Doors shall open automatically when the car has arrived at or is leveling at the respective landings. Doors shall close after a predetermined time interval or immediately upon pressing of a car button. A door open button shall be provided in the car. Momentary pressing of this button shall reopen the doors and reset the time interval.
- D. Door hangers and tracks shall be provided for each car and hoistway door. Tracks shall be contoured to match the hanger sheaves. The hangers shall be designed for power operation with provisions for vertical and lateral adjustment. Hanger sheaves shall have polyurethane tires and pre-lubricated sealed-for-life bearings.
- E. Electronic Door Safety Device. The elevator car shall be equipped with an electronic protective device extending the full height of the car. When activated, this sensor shall prevent the doors from closing or cause them to stop and reopen if they are in the process of closing. The doors shall remain open as long as the flow of traffic continues and shall close shortly after the last person passes through the door opening.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Field measure and examine substrates, supports, and other conditions under which elevator work is to be performed.
- B. Do not proceed with work until unsatisfactory conditions are corrected.
- C. Prior to start of work, verify hoistway is in accordance with shop drawings. Dimensional tolerance of hoistway from shop drawings: -0 inches +2 inches. Do not begin work of this section until dimensions are within tolerances.
- D. Prior to start of work, verify projections greater than two inches (four inches if ASME A17.1/CSA B44 2000 applies) must be beveled not less than 75 degrees from horizontal.
- E. Prior to start of work, verify landings have been prepared for entrance sill installation. Traditional sill angle or concrete sill support shall not be required.
- F. Prior to start of work, verify elevator pit has been constructed in accordance with requirements, is dry and reinforced to sustain vertical forces, as indicated in approved submittal. Verify that sumps or sump pumps located within pit will not interfere with installed elevator equipment.
- G. Prior to start of work, verify control space has been constructed in accordance with requirements, with access coordinated with elevator shop drawings, including sleeves and penetrations.
- H. Verify installation of GFCI protected 20-amp in pit and adjacent to each signal control cabinet in control space.

3.2 PREPARATION

- A. Coordinate installation of anchors, bearing plates, brackets and other related accessories.

3.3 INSTALLATION

- A. Install equipment, guides, controls, car and accessories in accordance with manufacturer installation methods and recommended practices.
- B. Properly locate guide rails and related supports at locations in accordance with manufacturer's recommendations and approved shop drawings. Anchor to building structure using isolation system to minimize transmission of vibration to structure.
- C. All hoistway frames shall be securely fastened to fixing angles mounted in the hoistway. Coordinate installation of sills and frames with other trades.
- D. Lubricate operating system components in accordance with manufacturer recommendations.
- E. Perform final adjustments, and necessary service prior to final acceptance.

3.4 CONSTRUCTION

A. Interface with Other Work:

1. Guide rail brackets attached to steel shall be installed prior to application of fireproofing.
2. Coordinate construction of entrance walls with installation of door frames and sills. Maintain front wall opening until elevator equipment has been installed.
3. Ensure adequate support for entrance attachment points at all landings.
4. Coordinate wall openings for hall push buttons, signal fixtures and sleeves. Each elevator requires sleeves within the hoistway wall.
5. Coordinate emergency power transfer switch and power change pending signals as required for termination at the primary elevator signal control cabinet in each group.
6. Coordinate interface of elevators and fire alarm system.
7. Coordinate interface of dedicated telephone line.

3.5 TESTING AND INSPECTIONS

- A. Perform recommended and required testing in accordance with authority having jurisdiction
- B. Obtain required permits and provide originals to Owner's Representative.

3.6 DEMONSTRATION

- A. Prior to final acceptance, instruct Owner's Representative on the proper function and required daily maintenance of elevators. Instruct personnel on emergency procedures.

END OF SECTION